GETINGE

NOVUS I

Laboratory Sterilizer Manual

Rev. 4.0

Getinge International, Inc. 1100 Towbin Ave., Lakewood, N.J. 08701
Telephone: (908) 370-8800 — Fax Number: (908) 370-2543

SECTION A

INSTALLATION INSTRUCTIONS

1.1 All units are shipped attached to a wooden pallet, and rquire the use of a pallet jack. The delivery truck must have a lift gate if the loading dock is at ground level. All units must be removed from the pallet in the dock area or they may not fit through existing door jambs.

1.2 Check the sterilizer to insure that the model number, serial number, and other information on the data plate conforms to the ordering information. The data plate is affixed to the right side of the machine next to the ASME "U" stamp. The stainless steel cabinet side panel, if so equipped will require removal to inspect plate.

1.3 Examine the sterilzer for any sign of shipping damage. Any damage noted should be promptly reported to the transport company that was responsible for delivery, and to the Getinge International shipping department at 201-370-8800.

1.4 Do not remove the protective plastic film from the stainless steel panels until the installation is completed. This reduces the chance of damage to the finish during unpacking and installation.

UNPACKING 16"X16" & 20"X20" CROSS SECTION UNITS (DOORS)

1.5 Remove the two wooden blocks which secure the sterilizer frame to the pallet. The nuts holding the front block can be reached by lifting the front panel up and out. The nuts holding the rear block can be reached by removing the side panels (if so equipped).

CAUTION: Do not tilt the unit too much, or set it down on the one leg as the unit could become unstable and tip over. Gently lift and lower the rear of the sterilizer so that all four legs are now resting on the floor.

1.7 Maneuver the forks of a fork lift truck under the frame of the unit from the load end. Deliver to installation site. Stainless steel floor pads are provided. They are taped to the frame under the machine.
Place one pad under each leg when installing.

(See Section 1.19)

UNPACKING 26"X26" CROSS SECTION UNITS (AUTOMATIC DOORS)

1.8 Position pallet lift forks, of a suitable capacity lift truck, under the pallet from either side and lift pallet and sterilizer.

1.9 Remove the two 4"x4" wooden cross braces from the front and back of the pallet. It may be necessary to forcibly remove these braces with a sledge hammer, or pry off with a crowbar.

1.10 Lower pallet and sterilizer onto 4"x4" wooden blocks placed under each corner of the pallet. Position support blocks out as far as possible to support pallet and still bear the weight of the sterilizer.

1.11 Remove center boards from pallet leaving sterilizer attached to the two end pallet boards.

1.12 To prevent damage to the sterilizer door or door frame sill, build up forks of pallet jack with boards removed from the center of the pallet and position forks from load end of the sterilizer between the 4"x4" supporing blocks and underframe of the steriilizer.

1.13 Lift sterilizer. Remove brackets from sterilizer frame and remaining pallet boards. There are two brackets located toward the front and rear of each side of the unit. Remove the four screws holding the metal pads under each sterilizer leg to the remaining pallet boards. Remove boards.

1.14 Measure door jamb widths between dock and installation site. It may be necessary to remove all side panels if unit is cabineted. To reduce the total width to 34 1/2", the two panel supporting posts on each side of the sterilizer must also be removed.

1.15 Deliver sterilizer to installation site.

1.16 Lower sterilizer onto 4"x4" wooden blocks placed under the four sterilizer legs. Remove pallet jack forks.

1.18 Lift each leg and remove the supporting 4"x4" wooden blocks. Place a floor pad under each leg. Note: Lifting the legs can be simplified by use of a Johnson bar.

CAUTION: Installation should be performed by qualified and authorized technicians. Faulty installation could jeopardize personal safety and invalidate the warranty on the sterilizer.

STANDARD INSTALLATION

1.20 Place the sterilizer close to, but preferable not over a drain. Leave a minimum clearance of 30" on both sides for good operation and easy and safe maintenance of the sterilizer. The back of the sterilizer may be closer to a wall.

CUSTOM INSTALLATION:

1.21 Place the sterilizer in accordance with blueprint payout provided by Gentinge.

1.22 Adjust the leveling legs so the bottom of the chamber matches the height of the loading equipment. Check the horizontal of the chamber bottom by use of a spirit level or suitable test device.

PRE CONNECTION REQUIREMENTS

(Refer to Drawings for typical connection details)

1.23 Remove impurities by flushing all utility lines before their connection to the sterilizer.

1.24 Mark and identify all pipes, valves, controls and electrical leads. Refer to piping and electrical diagrams and schematics om Section F.

1.25 Shutoff valves should be installed in the supply lines near the equipment so that the sterilizer can be serviced without shutting off the building supply. If the sterilizer is installed next to other equipment, shut off valves and disconnect switches should be placed in the lines to permit isolation of the equipment to be serviced.

ELECTRICAL REQUIREMENTS AND CONNECTIONS

1.26 The electric componets of the control unit will tolerate supply line voltage variations of $\pm 10\%$. If fluctuations are greater than $\pm 10\%$, a voltage stabilizer must be installed between the sterilizer automatic fuse and the control equipment.

1.27 Connect the sterilizer to a 60 Hertz disconnet located in close proximity to the unit. If only single phase service is required (consult data plate), a 120 volt connect is the only power circuit required. If a three phase service is needed, connect 208 volt, 220/240 volt, 440 volt or 460/480 volt service as specified on data plate. Refer to tags on electrical boxes for correct placement of wiring.

1.28 VACUUM PUMP UNITS ONLY.

Test for correct rotation of the vacuum pump shaft. This is accomplished by a very momentary contact of the on-line starter swtich located in the power input box.

Caution: Do not hold the on-line starter switch in the "on" position for more than a second, as running the pump dry will damage the pump.

Watch motor fan to insure that rotation conforms to the arrow on the pump housing. (located behind the pump piping near the electrical housing.) If shaft rotation does not conform to the arrow on the pump housing, switch any two terminals of the main supply conduits to reverse the direction of rotation.

Note; The arrows on the head of the pump indicate the inlet and outlet of the pump not the rotation.

WATER REQUIREMENTS AND CONNECTIONS

1.29 Connect the sterilizer to a supply line with a water hardness of not more than 80 ppm plosulate. When using harder water, a water softening filter should be installed on the water line to the sterilizer. If the strainer or filter is common to more than one sterilizer, each sterilizer should have its own shut-off valve. The water line pressure should be a minimum of 40 psig and a maximum of 60 psig, with a maximum temperature of 70°F. For best performance, the vacuum pump sealing water temperature should not exceed 60°F. Water with higher temperature may be used provided a reduction in capacity and depth of evacuation is acceptable. A gauge is required for continuous monitoring of the water pressure.

STEAM REQUIREMENTS AND CONNECTIONS

NOTE: The effectiveness of steam sterilization is dependent on the character and quality of the steam used. Steam generators based upon evaporation from high pressure hot water should not be used since the steam produced is of inferior quality for sterilization purposes.

1.30 PURITY; Since the steam comes in physical contact with the goods to be sterilized, it should be free from solid particles such as welding pellets, rust flakes, sand, or foreign matter.

1.31 Liquids, with the exception of very small amounts of water, should not be present. Steam supply should be trapped by customer just before the service supply manual shut-off valve.

1.32 Gases will prevent a close contact between the steam and the microorganisms and should be minimized, especially for those gases listed below. Appropriate filters and traps must be utilized to meet these requirements.

- ☐ Hydrazine (N_2H_4) max. 0.11 mg/kg steam.
- ☐ Ammonia (NH_3) max 5 mg/kg steam.

1.33 Air must be eliminated or it will cause a failure with the Bowie/Dick test, since air will prevent the steam from coming in contact with the material to be sterilized.

1.34 All other chemicals such as water softening compound residuals must be elimiated.

1.35 The salt content should not excess 1mg/kg steam.

1.36 PRESSURE: Getinge sterilizers should be supplied with a steam pressure of 60 to 80 psig,

1.37 Pressure fluctuations should not exceed 5 psig.

1.38 MOISTURE CONTENT: Sterilizers should be supplied with dry saturated steam. Although it is difficult to maintain steam in the physicial state of "dry saturation," in a practical manner, the methods described in sections 1.28 through 1.35, will generally result in a steam with satisfactory moisture content. These methods are based on practical experience and will help eliminate "dry saturation." Superheated steam is hazardous as it does not contribute the humidification necessary for the destruction of microorganisms. The superheating measured in the chamber must not be more than 9°F or 5° C.

PRACTICAL METHODS FOR PRODUCING DRY SATURATED STEAM:

Connect the sterilizer to a live steam supply, not to an inadequately drained or inadequately vented "dead leg." Long branch connections to the sterilizer should be avoided.

1.39 The slope of the steam supply pipes toward the sterilizer should be a minimum of 1/8"/ft.

1.40 The steam pressure upstream of the reducing valve should not fluctuate more than 10%.

1.41 Do not reduce the pressure by a factor of less than 1/2 at each stage. If necessary, use a second reducing valve for a greater reduction ratio.

1.42 Put the last reducng valve not more than a 20 ft. pipe length from the sterilizer, and not closer than a 12 ft. pipe length from the sterilizer if the maximum reducing ratio (2:1) is used.

1.43 The steam should not be supplied to any other equipment downstream of the last reducing valve.

1.44 Branch pipes should be connected on top of the horizontal main pipe.

1.45 A connection should be provided on the steam supply line adjacent to the sterilizer to enable steam to be sampled for the presence of non-condensable gases, for wetness, and for contaminants.

AIR REQUIREMENTS AND CONNECTIONS

1.46 A shut-off valve should be installed in the pressurized air supply line close to the sterilizer. A pressure gauge is recommended to monitor the air supply.

1.47 Conect the sterilizer air supply fitting to the building compressed air supply line. The system should be capable of delivering clean dry air with a minimum of 80 psig and a maximum of 100 psig.

DRAIN

1.48 Sterilizers equipped with more than one waste water connection should have them all piped separately to the floor drain. Check to determine if there are any local regulations regarding the drain restrictions, such as temperature, etc. Getinge sterilizers are designed to cool discharge effluent down to 130°F, which is below, if not all, local code requirements.

1.49 Run a sloping pipe from the sterilizer outlet with an unreduced bore to the drain which has a recommended 4" diameter. The pipe should terminate not closer than 1/2" above the highest liquid level of the water trap. The sterilizer must have an air break between the drain pipe and the floor drain. The sterilizer CANNOT be hard piped to drain.

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FUNCTION TEST

1.50 Open the valves to admit water and steam, and if necessary, adjust both for recommended pressures.

HI VAC UNITS ONLY

1.51 Check water pressure to vacuum pump and adjust if necessary. Pressure should be set at 3/psig, (O/psig at full vacuum).

1.52 Check for air leakage, sealing water flow and leakage to the vacuum pump (if so equipped).

1.53 Run all processes while checking pressures, temperatures, times, and functions of all signal lights. Operation Instructions and Set Points will be found in Section C, "OPERATION."

1.54 Check supply pipes and sterilizer for steam and water leakage. Remove front and side panels of the cabinet type sterilizers for complete inspection.

1.55 Test the safety valves by lifting the manual lever of each valve while the chamber/jacket is pressurized. Steam should blow out if they are functioning correctly.

1.56 Check door operation for smoothness of opening and closing during operation .

1.57 Record, date and file all test results.

SECTION B

PRELIMINARY CHECKS

BEFORE OPERATING

2.1 Check to insure that water, steam and electrical power are all being supplied to the sterlizer.

2.2 Before proceeding, familiarize yourself with location and function of all switches and indicator lights.

2.3 Depress ON/OFF power switch on Pacs-50 Program Control Panel. The switch will illuminate indicating power is being supplied to the Pacs-50 Control system and the sterilizer.

2.4 Insure that the printer has paper. To refill paper, refer to Section E, Maintenance.

2.5 Check that steam is entering the jacket by observing the jacket pressure gauge, located on the control panel (See Fig. 3). Be sure to allow some time (5 to 15 min.) for the jacket to heat fully, before proceeding.

SECTION C

LOADING

PRINCIPALS

3.1 Understanding how to load the chamber is an important part of operating the sterilizer. This section is a general guide for helping the operator understand some of the principals of sterilization. Before placing an item in the sterilizer an operator should always make sure the correct cycle is run for a particular product. Running the wrong cycle for a product can result in product, sterilizer, or personal injury.

CAUTION: When there is any doubt about the correct cycle to use for an item, or whether an item is autoclavable or not, contact the manufacturer of the item or product for the recommended sterilization procedure.

3.2 When loading the sterilizer never cover the drain(s) at the chamber bottom. The use of shelving to lift the load above the chamber floor is always desirable. Keep the load from touching the top, sides, back and bottom of the sterilizer. This creates optimum conditions for steam penetration, and drying capabilities. Never overload the sterilizer, this could prevent sterilization.

WRAPPED GOODS (P1) & HARD GOODS (P2)

3.3 Distribute the goods evenly throughout the chamber, do not stack goods or packages one on top of the other. Leave some space between packages to allow steam to penetrate the pack.

3.4 Empty containers (i.e., flasks, buckets, bags, etc.) should be placed upsidedown or on their sides. This will allow the containers to "empty" air and steam condensate. This will also enhance the drying capabilities of the unit.

NOTE: Bio-Hazard or garbage bag like containers should have a small opening in them to allow the bag to breath, preferably at the point of closure.

3.5 When mixing loads of fabrics and hard goods (heavieritems) always place the hard goods on the lower shelves. This will enhance and shorten the drying time.

CAUTION: Never sterilize any liquid in any cycle other than a liquid cycle. Sterilizing a liquid in a wrapped goods or hard goods cycle could result in damage to the sterilizer or personal injury.

CAUTION: When there is any doubt about the correct cycle to use for an item, or whether an item is autoclavable or not, contact the manufacturer of the item or product for the recommended sterilization procedure.

3.6 Bottles containing liquids are placed upright and evenly distributed throughout the chamber. After a cycle is complete there may be a loss or gain of liquid, but it should not exceed
-+5%. An operator cannot open the door until the liquid has cooled to a safe temperatiure. Please restrain from unloading the autoclave for 15-10 minutes after "cycle end," this will allow further cooling and reduce the chance of an accident.

Guidelines for loading a liquids cycle are listed below to insure safety.

- ☐ Use liquids (P3) cycle for liquids, NO other cycle.
- ☐ Use a container designed for sterilization such as Pyrex, not regular glass.
- ☐ The container must be able to vent, if it is a screw or snap on cap leave the cap VERY loose.
- ☐ Restrain from removing bottles until they are cool to the touch.
- ☐ Do not move a bottle if it is boiling or bubbling, the bottle may explode.

Be patient !, a few minutes time can prevent a serious accident.

SECTION D

OPERATING INSTRUCTIONS

SETTING PARAMETERS

4.1 Turn the "power on" and wait for the jacket to heat up (10- 15 min) if you have not already done so. (see section B)

4.2 MANUAL DOOR UNITS ONLY

Lift the load door to the fully closed position. The door will lock into position. The "DOOR CLOSED" light on the Pacs-50 control panel will light indicating the door is closed (double door units-"door closed" indicates that the opposite door is closed).

NOTE: Although the door(s) is closed and locked, the gasket is not pressurized, sealing the door(s).

4.3 AUTOMATIC POWER DOORS.

Depress the door button and hold the button until the door is completely closed. If you lift your finger off of the button, before the door is closed, the door will automatically re-open.

CAUTION: If the door does not re-open before it is completely closed contact Getinge International immediately before operating the unit.

SETTING THE PARAMETERS

The cycle values can only be set before starting a cycle. Once in cycle the values are locked in and can not be changed. First select the cycle you wish to change. To change a value press the cycle values button. The sterilizer temp lamp will light and the current sterilizer temperature will be displayed in the window. If you wish to change the sterilize temperature utilize the up and down arrow keys. Holding down either the up or down key will increment the value by O.1. Holding the arrow buttons down for a short time will cause the display to speed up and make access to greater changes in value easier. Press the cycle value button again and the sterilizer time lamp will light along with the display. To change the value use the up or down arrow key. Press the cycle value button again and the dry time lamp will light if it is used in that particular cycle (there is no drytime in a liquids cycle, for example). Use the up and down keys to change the drytime. Press the cycle values button a fourth time and the dry time lamp will extinguish. When none of the cycle value lamps are lit you are no longer in the cycle value mode.

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PRINTER FUNCTIONS

Paper Feed

One press of the paperfeed button will advance the docu-pac printer paper one line. This button will not function if the printer hold option is selected.

Printer Hold

The printer hold option is used to hold the printed information within the Novus control system. The cycle run data will not be printed out until the completion of the cycle.

NOTE: If during the cycle the printer hold is disabled, the Novus controller will print all previous data .

To enable this option press the printer hold button, this will turn the lamp within the button on and indicate that the option has been selected. To turn it back off press the button again and the lamp will extinguish, indicating the printerhold option is off.

PRINTER ON (Novus laboratory units only)

The printer on button is used to control the printer. Information will be printed out while this lamp is on. If the lamp is on all data will be recorded and sent to the printer. If the lamp is off all cycle data will not be recorded.

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SETTING THE AUTOMATIC JACKET SET BACK (AJSB).

The Automatic Jacket Set Back is used to turn off the jacket and then turn it back on at specific times of the day. This is very usefull if you wish to conserve steam use or preheat your Novus unit before the first shift of the day. Preheating the unit will enable the first shift to begin using the sterilizer immediatley, they will not have to turn the unit on and wait for the jacket to heat and waste valuable workforce time.

THE AJSB MODE CAN ONLY BE ENTERED WHEN THE UNIT IS OUT OF CYCLE AND IN STANDBY.

- ☐ To set the AJSB press the I in Novus I.
- ☐ The time at which the jacket turns on is displayed, adjust to desired time by using the up and down arrow keys.
- ☐ Press I again and the time at which the jacket turns off is displayed, adjust this time as you did in the previous step.
- ☐ To leave the AJSB mode press the I a third time.

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SETTING THE CLOCK

THE CLOCK CAN BE SET ONLY WHEN THE STERILIZER IS IN THE STANDBY MODE (NOT IN CYCLE).

- ☐ Begin by pressing the V in Novus, this action will cause the Novus controller to alternately flash "CL" (for clock).
- ☐ Set in the hours and minutes by utilizing the up and down arrow keys.
- ☐ When the desired time is displayed depress the V again and the Novus controller will store the desired time of day.
- ☐ The Novus controller will then display "YEAR" and alternately display its valve.
- ☐ Adjust the desired year by using the up and down arrow keys if necessary.
- ☐ To move to the next level in the menu press the V again which will store the year, display "ONTH" (for month) and it's value. Adjust the month as in previous steps.
- ☐ Press the V again and the "day" will be displayed, alternately displaying the value.
- ☐ Again use the up and down keys to adjust the day.
- ☐ Once again press the V in Novus and "no." (for sterilizer number) will be shown in the displayer. Use the up and down arrow keys to set in your sterilizer number.
- ☐ At this point you have completed the menu for the clock set mode. To leave this mode simply press the V one final time and the chamber temperature will be displayed. This is the indication that you have left the clock set mode and returned to the standby mode.

NOTE: If there is no input from the operator when in this mode for more than approximately 20 seconds, the chamber temperature will be displayed. If this occurs the last change mode may not have been entered into the Novus controller.

4.4 Dpress the "START" switch on the NOVUS Program control panel. The selected cycle will be iniated and the chime will sound.

NOTES:

- ☐ Cycle selected
- ☐ Sterilization temperature
- ☐ Sterilizer exposure time
- ☐ Drying time
- ☐ Load Number
- ☐ Charge Number
- ☐ Sterilizer identification number
- ☐ Date
- ☐ Time cycle started

2. The Novus control system will automatically progress through the phases of the selected cycle until cycle is complete. The "AIR REMOVAL," 'EXPOSE," and "POST CONDITIONING" lights on the NOVUS Program control panel will illuminate, in sequence, indicating the cycle phase being accomplished. If double door unit, the same lights will be illuminated on the Unload Status Panel.

4.5 During the cycle, the following information can be displayed by depressing the appropriate Novus control panel switch.

- ☐ CHAMBER PRESSURE (OR VACUUM)
- ☐ CYCLE VALUES
- ☐ FAULT

NOTE: The parameter displayed will be automatically updated at six second intervals.

4.6 The printer will automatically print and identify the initiation of each cycle phase, indicating temperature, time (24 Hour Notation), and pressure or vacuum. Information will be automatically updated and the current data-printed. See sample printout and further information. (see fig. 18)

OPENING THE DOOR AT END OF CYCLE

4.7 When the cycle has been completed, the "CYCLE END" light on the Pacs-50 Program control panel will illuminate indicating a completed cycle.

4.8 The door may be opened at this time.

MANUAL TWO DOOR UNITS

4.9 *NOTE: If double door unit, the unload door may be opened by pushing in the door locking knob, located on the middle right of the back panel, just below the door. The load is removed and the door is then lifted into the closed position. After 30 second delay, the load side door can be opened by pushing in door locking knob located below door on right middle of front panel. "DOOR" switch light will be extinguished at this time.*

AUTOMATIC TWO DOOR UNITS

4.10 *NOTE: The unload door may be opened at this time. The load is removed and the "DOOR" switch on the unload program status control is depressed. The unload door will automatically close. After a 30 seonds delay, the load side door can be automatically opened by depressing the "DOOR" switch on the program control panel. The "DOOR" switch light will be extinguished at this time.*

The sterilizer is now ready for the next cycle.

OPTIONAL CYCLES

The P4 and P5 cycles are options that your particular unit may be equipped with.

P4 - FLASH

4.11 This cycle is used for fast sterilization of product. Selecting the time and temperature is the same as other cycles. After closing the door, press the start button, the unit will automatically step through cycle, and pull a quick vacuum (30 seconds) at the time of exhaust to remove excess steam.

P5 - BOWIE/DICK-TYPE CYCLE

4.12 This cycle is programmed to comform to pre-conditioning and post-conditioning standards of these air removal tests. The time and temperature are selectable, to adjust to various manufacturers' recommendations. Select the time and temperatures and change them to your desired needs as you woul any other cycle. The unit has been pre-programmed for you at 3.5 minutes at 273°F.

ALARM /ERROR AND TIME OUT FAULTS

4.12A ALARM: If a "FAULT" occurs in an approaching or preceding sterilizer phase, an audio signal will sound and the "FAULT" switch light on the control panel will light. "FAULT" signals occurring while a cycle is in progress will stop the cycle, causing valves to close and isolate the chamber.

The following reasons are cause for a "FAULT" signal:

- ☐ Power failure for more than 20 seconds
- ☐ Steam pressure loss
- ☐ Door not completely closed and secured
- ☐ Temperature sensor defective
- ☐ Pressure sensor defective
- ☐ Incomplete phase time
- ☐ Too long in a particular phase.

4.13 The "FAULTS" listed above are separated into "ERROR" (Er) and "TIME OUT" (to) signals. To turn off the alarm, identify the condition and abort the cycle, the following procedure must be followed:

Depress the "FAULT" switch on the control panel. Then depress the "START" button.

- ☐ The Audio signal will cease
- ☐ The fault light will remain illuminated

The display on the control panel, will indicate the "ERROR" (Er), or "TIME OUT" (to) with the following codes:

"ERRORS"

- ☐ Er1 - Temperature sensor fault
- ☐ Er2 - Pressure sensor fault
- ☐ Er8 - Door(s) not completely closed and secured.
- ☐ Er9 - Power failure for more than 20 seconds duration.

4.14 The Novus controller will automatically select the correct cycle for aborting and will automatically step to the "POST CONDITIONING" stage.

Note: The operator must re-select a new cycle when running the next cycle after an abort. The controller will remain in the cycle selected for an abort, until a new one is chosen.

When "POST CONDITIONING" has been completed the "CYCLE END" light on the control panel will illuninate.

The printer will indicate and print "PROC ABORT" with the "ERROR" or "TIME OUT" code and the time of the abort in a 24 hour notation .

The load door at this time may be opened.

Depress "FAULT" switch on the Pacs-50 Program control panel to extinguish the FAULT light.

NOTE: If the display reappears after a few seconds, it indicates an "ERROR" or "TIME OUT" is still present. Contact maintenance personnel or call the Getinge International Inc. Service Department at (201) 370-8800.

IMPORTANT:

- ☐ If more than one "FAULT" occurs, only the last one to occur will be displayed.
- ☐ A cycle cannot be initiated if the "FAULT" light is illuminated.
- ☐ Depressing the "FAULT" switch when there is no "FAULT" will cause the display to indicate "Eo".
- ☐ With a double door sterilizer, a "FAULT" prevents the unloading door from being opened at cycle end. The loading door can be opened at the cycle end. The only exception is when the "FAULT" occurs late in the post conditioning phase of the cycle and the door gasket grove is in the process of being evacuated.

MANUAL ABORT PROCEDURE

4.15 When a manual cycle abort is necessary due to the wrong cycle switch being depressed, incorrect load used, or for any reason the OPERATOR finds it necessary to end or change a cycle, the following procedure must be floowed:

- ☐ Depress the "ON-OFF" Power switch on the Pacs-50 Program control panel. The "POWER" light will be extinguished.
- ☐ Wait 30 seconds.
- ☐ Depress the "ON-OFF" power switch again to re-apply power to the sterilizer. The "POWER" light will illuminate.

NOTE: At this time, the "FAULT" light will be illuminated and the alarm signal will sound. (The Pacs-50 Program controller senses a power failure of more than 20 seconds).

Depress the "FAULT" switch on the Pacs-50 Program control panel, to acknowledge a "FAULT" condition and silence the alarm.

SECTION E

GENERAL MAINTENANCE

GENERAL

5.1 Your Getinge sterilizer has been designed to provide long term service with minimum maintenance and down time. It is important to maintain the interior and exterior cleanliness of your sterilizer and to follow the maintenance schedule and procedures contained in this section of the instruction manual. To help insure that these procedures are followed, maintenance has been divided into daily, weekly, and quarterly schedules.

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NOTE; Any maintenance or repair not addressed in this section of the instruction manual should be performed by a qualified technician from Getinge International Inc., or a trained, in house, service technician.

Getinge International Inc. has available, a technical manual, for indepth instructions on the pacs 50 control for in-house qualified service personnel. Call Getinge International Inc., 201-370-8800, for ordering and cost information.

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EXTERIOR AND CHAMBER CLEANING

5.1a Clean the exterior stainless steel surfaces WEEKLY with an organic solvent such as trichlorethylene, an ordinary household cleaner, or a stainless steel polish.

5.2 The Sterilizer chamber is manufactured from high grade stainless steel (316) amd should be cleaned DAILY to remove spillage and staining, and to prevent damage to the surfaces.

5.3 Remove shelves and all loose plates. A mild cleaning solution should be used. For particularly stubborn stains, a mild scouring powder or stainless steel cleaner can be used, and rinsed thoroughly.

5.4 Check drain filter DAILY for any sign of possible blockage by paper, fabric, or other foreign material. This is especially important if any breakage of glass or a load package occurs.

DOOR SEAL

5.5 Visually Inspect door seal gasket DAILY for signs of wear. Check for the gaskets full retraction into the door seal channel.

DOOR SAFETY - AUTOMATIC DOORS

5.7 On a WEEKLY basis, test the safety stop feature of the automatic door(s) by applying slight pressure to the leading edge of the door during its closing motion. If the door does not stop motion when pressure is applied, contact Getinge International Service Department. (201) 370-8800. It is necessary to hold (or have someone hold) down the door button, to check this feature.

5.8 On a QUARTERLY basis, or if demanded sooner, remove the door seal gasket(s). Make a complete inspection for replacement or re-seating. (See section on changing the door gasket 5.22).

PRESSURE RELIEF VALVE

5.9 On a QUARTERLY basis, test the operation of the pressure relief valves for both jacket and chamber. While in cycle, and using heat protecting gloves, activate the lever on top of the valve by momentarily lifting the lever. Steam should escape if the valve is functioning. Be sure not to place any part of your body in the direction of the escaping steam. (opposite side of the valve lever). If valve does not function, DO NOT OPERATE THE STERILIZER. Contact Getinge International Inc. Service Department at (201) 370-8800.

STRAINERS

5.10 On a quarterly basis, or more frequently if necessary, remove and clean the Y-Strainers located in the piped supply lines. The strainers are located just past the supply inlet connections. See Section E, for locations.

Your Getinge sterilizer is equipped with a Y-Strainer on the outlet of the jacket. It is located just upstream of the jacket steam trap.

In addition to these Y-Strainers there is an inline chamber drain Y-Strainer. It is located downstream of the chamber drain strainer, and before any exhaust valves. See figure for location.

NOTE: If the unit is equipped with G.N.P. Bleeds, there are also Y-Strainers on the outlet of the bleed. Check the piping schematic supplied with your Getinge sterilizer for other strainers which may be unique to your unit.

It is critical to the operation of the unit that these strainers remain clean. Using a wrench, remove the strainer holding nut by turning counterclockwise and sliding the assembly out.

- ☐ Remove the metal strainer from its holder.
- ☐ Clean the inside and outside by using compressed air or a brush and mild detergent.
- ☐ Place pipe sealant (pipe dope, teflon tape, etc.) on threads of nut.
- ☐ Replace the strainer back in the holder.
- ☐ Replace the strainer assembly by turning it clockwise until securely seated.

5.11 If your unit is equipped with pneumatic doors (automatic) or valves, on a QUARTERLY basis, check the air lubricator for correct oil level. If oil level is not at the level line indicated on the receptacle:

- ☐ Turn off compressed air supplying the unit and relieve the pressure in the line.
- ☐ With the air regulator gauge reading 0 Psig, unscrew the filing screw located on the top of the lubricator.
- ☐ Fill to the filling line with fresh oil. Use non-fluid oil air lube 10 h/nr, avail-

able from Getinge (see spare parts list).

☐ Replace screw, tighten securely.

☐ Turn compressed air on and inspect for leaks.

5.12 On a QUARTERLY basis, check the pressure of the incoming steam, water and air. Readjust valves to correct any pressure difference, positive or negative, to agree with those settings as indicated on the piping schematic.

5.13 On a QUARTERLY basis, inspect all pipes, valves, and connections visually for evidence of leakage or corrosion. contact your maintenance department or Getinge International Inc. Service Department for repair on any leaks or corrosion.

LUBRICATING DOORS

5.14 Lubricate door guides with a high temperature grease to keep the sterilizer door(s) running smooth. Run a small bead (1/8") along the stainless steel rail(s) that comes in contact with the bearing or eccentric (manual doors) of the door.

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PRINTER: CLEANING, PAPER LOADING, RIBBON CHANGING

5.15 Proper maintenance of the printer mechanism requires periodic cleaning to remove any buildup of ink particles, paper shavings, or other foreign material. On a QUARTERLY basis, the printer mechanism should be cleaned as follows:

CAUTION: Be sure power is not being applied to the NOVUS controller while working with the NOVUS controller while working with the printer.

- ☐ Depress the printer panel into the unit. It should spring out 1/4 to 1/2 inch forward. Carefully removing loose particles or dried ink which may be in printer. At this time, you can access the internal printer assembly.
- ☐ Use alcohol to remove grease or stains. A hand held vacuum cleaner
- ☐ is recomended to remove loose dirt or debris.

CAUTION: Do not use cleaning agents. These agents could dissolve or seriously deteriorate the plastic parts of the printer mechanisum.

CHANGING THE PAPER

5.16 Repeat Caution.

- ☐ Depress the printer panel into the unit. It will spring out 1/4 to 1/2 inch forward.
- ☐ Remove the Rainbow Ribbion Cable that is connected at the rear of the internal printer mechanism. This will enable you to work with the printer away from the sterilizer. The connector easily pulls away from the P.C. board inside the box. Both hands are needed to replace the paper.
- ☐ Remove the printer ribbon (see sec. 5.17)
- ☐ Pull out the roll of old paper located at the rear of the printer. (If the paper take up option was being used). Do this by pulling the bar and paper up by the end with the wheel. Be careful not to loose the rubber o-ring.
- ☐ Remove the paper roller located towards the front of the printer by pulling upward. Re-use the plastic spindle for the next roll of paper.
- ☐ Place the plastic spindle in the new roll of paper. Drop the roll back into the front of the printer. A slight force may be required. Make sure the paper will roll out of the top of the paper.
- ☐ Run the papr through the paper detector (small black box with three colored wires connected to it, orange, yellow, green). Then loop the paper between the small crevice under the paper head mechanism.
- ☐ Use your other free hand to spin the rubber roller located at the front of the printer. Use a finger or finger nail to spin the roller down.
- ☐ After getting the paper through the roller, pull the paper forward 5 to 6 inches out. If you have gotten this far on your own, take a break you deserve one.
- ☐ Thread the paper through the ribbon and snap the ribbon back into place on the front of the printer.

If using the Paper Take-Up, follow the steps below. If not, jump ahead to placing the printer in the NOVUS Panel.

- ☐ Thread the paper into the slot at the front of the printer to return the paper back into the printer.

- ☐ Thread the paper into the slot at the front of the printer to return the paper back into the printer.
- ☐ Fold the leading edge of the paper into a pointed tip. Do this by folding the left corner back to the right edge of the paper.
- ☐ This is don so that the paper can be inserted into the metal roller.
- ☐ Pull the paper into the box at the rear of the printer. (Between the printer take-up motor and the new roll of paper).
- ☐ Place the tip of the paper into the slot of the metal spool and replace into its' slot. Do this at the same angle as it was removed. Manually turn this spindle to take up the excess paper.
- ☐ Replace the rubber o-ring onto the wheels of the motor and spindle.

Replacing the Printer into the NOVUS Panel.

- ☐ Place the ribbon edge connector into the PC card.
- ☐ Slide the printer in and press firmly. The printer should now be held in place.
- ☐ Turn the NOVUS Controller on and press the paper feed button to assure that the printer is working correctly.

CHANGING THE RIBBON

5.17 A new ribbon is requied when the printing becmes faint and difficult to read. It is advisable to change the ribbon prior to the point of difficult reading. The following procedure should be followed:

- ☐ Press the end of the ribbon cartridge marked "PUSH/EJECT". (The ribbon cartridge will swing out from the right towards you.)
- ☐ Remove the ribbon cartridge.
- ☐ Before inserting the new cartridge, rotate the cartridge dial in the direction of the arrow to tighten the ribbon.
- ☐ With the ribbon facing up, feed exposed paper between the ribbon and the plastic cartridge body.
- ☐ Replace the cartridge on the printer mechanism (it will click into place).

CHANGING THE DOOR GASKET

Accessing The Gasket

Manual Doors

5.17 Manual closing units require removal of the top plate/handle of the door. Remove the two phillips head screws located under the handle.

CAUTION: The front facia is held on by this plate and will fall forward.

5.18 Push the door down and remove the gasket by following the door seal removal instruction s (See Sec. 5.22)

POWERED VERTICAL DOORS (26X26)

5.19 Begin by turning the compressed air off to the unit. The top plate of your vertical powered door serves as a safety device. When depressed it stops the upward motion of the door and will reverse with some downward force. With the door open this plate is flush with the bottom of the chamber. The first step in removing the gasket is locating the safety plate

screws, which are approximately one inch from either end of the plate.

5.20 Remove both of the safety plate screws and push the plate to the left or right. This will loosen the plate and cause it to pop up about 1/2" to 1", then remove the plate by reversing the direction from which you started. This will expose the top of the door and allow access to lowering the door.

5.21 Located in the top center of the door are four (4) 6mm allen-key wrench screws. Loosen each screw (6) six turns each, this will lower the door and expose the lower portion of the gasket for easy removal. (See Sec. 5.22)

CAUTION: DO NOT remove these four (6mm allen key) bolts from the door. This will cause the door to drop from the air ram and the door will have to be lifted and realigned. Note also not to disturb any shims or smaller bolts which may be in place.

HORIZONTAL DOOR UNITS (26X36 AND UP)

5.21a Horizontal closing units have easy access to the door gasket. Direct access to the door seal is available, simply follow the door gasket removal steps. (See Sec. 5.22)

REMOVING THE GASKET

5.22 Insert a blunt instrument (such as a blunt flat head screwdriver) between the gasket and the groove. Gently remove the gasket by prying it forward out of the groove. Take care not to nick or gouge the gasket during this process. When a portion of the seal is out of the groove, carefully pull the remainder of the seal out for inspection.

- ☐ Carefully inspect the gasket around its entire circumference and length for cuts, nicks, or gouges, also be sure gasket is pliable at this time.
- ☐ If damage or wear is evident, replace with a new gasket, available from Getinge International.
- ☐ If no damage is evident, and gasket is pliable, clean the gasket with a mild scouring powder to remove all foreign particles and heavy stains. Dry with a lint- free cloth.
- ☐ Coat the gasket with a spray lubricant such as molykote 321R dry lubricant, and follow manufacturers' recommendation for drying time.
- ☐ Clean door gasket groove with a metal polish and dry with a lint-free cloth.
- ☐ If the door seal gasket is to be re-inserted, reverse the direction of the gasket. In other words, the surface of the gasket which had been facing the door should now be inserted to face the supply pressure (inside of the groove). This is to insure a long door seal life.

5.23 Locate the seam (joing point) of the door seal gasket. Place the seam of the gasket in the top center of the groove.

5.24 Install the door seal gasket by pressing it into the door gasket groove, working from the center of each side toward the four corners. Allow an equal amount of excess along each side, top and bottom. Equally distribute the excess and press the gasket as deeply as possible into the door gasket groove.

REPLACING THE TOP PLATE

MANUAL DOORS

5.26 Replace the top plate/handle and tighten securely.

POWERED VERTICAL DOORS

5.25 NOTE: For (26x26) automatic doors, tighten the four cylinder attachment screws with a 6mm allen-key wrench. Fit the safety plate by reversing the process in which it was removed. Fit the remaining screws and tighten.

CAUTION: Do not turn the compressed air back on until the safety plate has been refitted. Test the safety device after refitting to insure the door stall. Never use your hands.

and phase descriptions. The cycle graph depicts pressure as a function of time and separates the various segments of the cycle into phases. Each phase is then further defined by its phase description.

HOW TO USE THIS PACKAGE: Each cycle is divided into phases. The phase is labeled on the lower portion of each cycle graph. Match the phase label to its phase description page in the package. The phase description divides the phase into steps. Each step has a corresponding step number which refers to the actual step number used in the NOVUS I controller. The step number display is enabled by moving the dipswitch on bank 1 pole 1 to the "ON" position. Pressing the service button to the left of the START button will display the step number (see attached service overlay, the button is labeled STEP NO). Each step is then broken down into several divisions. General information and step conditions are described. Energized outputs are indicated by a pin, tag and its description. Pin refers to the number stamped on the controller side of the I/O connector. Tag refers to the label physically attached to the valve, and the description, of course, describes the valve. Time-out and delay times if applicable are indicated. Time-outs occur when step conditions (Sc) are not met within the allotted time.

Novus I - DIP switch functions (Rev 5.2-2 +)

DIP switch #1

OFF		ON
Auto Step	1	Manual step
Normal print	2	Data Acquisition
Services check off	3	Services check on
Air detection off	4	Air detection on [1]
With out ABORT button	5	With ABORT button [2]
Powered doors	6	Manual doors
Door Set-up	7	
	8	

Door setup -

Switch No.

7 8

OFF OFF A - Single Door
OFF ON B - Double Door
ON OFF C,D - Bioseal Door * CONTROL CORD SIDE
ON ON C,D - " " " UNLOCKED "
* C - Pass-thru Bioseal
D - Selectable Door Bioseal w/input 19a Jumper

[1] On EO units: Use dipswitch 1,5 for selection of come-up time-out in expose. "On" for with 3 hour timeout, "Off" for without.

[2] Was used for selection of BIOFOE or NOVUS headers. This option has been moved to Input 15a on Lab units only.

Novus I - DIP switch functions

DIP switch #2 -

Chamber Temperature Calibration	1 2
Jacket Temperature Calibration	3 4
Load #1 Temperature Calibration	5 6
Load #2 Temperature Calibration	7 8

Temperature Correction -

Switch No.		Correction
1	2	
OFF	OFF	- 0.4 °C
OFF	ON	- 0.4 °C
ON	OFF	+ 0.2 °C
ON	ON	+ 0.2 °C
3	4	
OFF	OFF	- 0.4 °C
OFF	ON	- 0.4 °C
ON	OFF	+ 0.2 °C
ON	ON	+ 0.2 °C
5	6	
OFF	OFF	- 0.4 °C
OFF	ON	- 0.4 °C
ON	OFF	+ 0.2 °C
ON	ON	+ 0.2 °C
7	8	
OFF	OFF	- 0.4 °C
OFF	ON	- 0.4 °C
ON	OFF	+ 0.2 °C
ON	ON	+ 0.2 °C

Novus I - DIP switch functions

DIP switch #3 -

Upper Pressure Calibration	1 2 3
Lower Pressure Calibration	4 5 6

OFF ON

°C	7	°F
Load probe off	8	Load probe on

Pressure Correction -

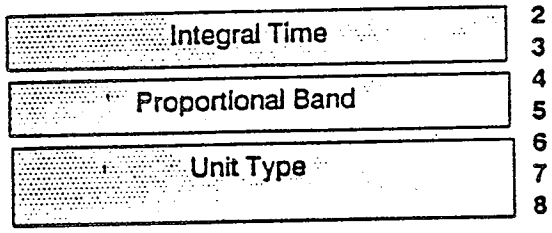
Switch No.			% of Span
1	2	3	
OFF	OFF	OFF	- 1.00
OFF	OFF	ON	- 0.75
OFF	ON	OFF	- 0.50
OFF	ON	ON	- 0.25
ON	OFF	OFF	+ 0.25
ON	OFF	ON	+ 0.50
ON	ON	OFF	+ 0.75
ON	ON	ON	+ 1.00
4	5	6	
OFF	OFF	OFF	- 1.00
OFF	OFF	ON	- 0.75
OFF	ON	OFF	- 0.50
OFF	ON	ON	- 0.25
ON	OFF	OFF	+ 0.25
ON	OFF	ON	+ 0.50
ON	ON	OFF	+ 0.75
ON	ON	ON	+ 1.00

Novus I - DIP switch functions

DIP switch #4 -

OFF ON

PSIA 1 PSIG



Integral Time -

Switch No. 2 3	Seconds
OFF OFF	5
OFF ON	10
ON OFF	20
ON ON	40

Proportional Band -

Switch No. 4 5	Degrees C
OFF OFF	2
OFF ON	3
ON OFF	4
ON ON	5

Unit Type / Testmode -

Switch No. 6 7 8	Type of EPROM HOSpital	LABoratory	WAShers	ETO
OFF OFF OFF	OR Flash I	G.P.	OR Washer	ETO
OFF OFF ON	CS Vacuum	Vacuum	CS Washer	
OFF ON OFF	CS Hi Vacuum	Hi Vacuum		
OFF ON ON	VAC Flash	G.P. low temp.		
ON OFF OFF	OR Flash II	Vacuum low temp.		
ON OFF ON		Hi Vacuum low temp.		
ON ON ON	Connection Test			

NOVUS I STERILIZERS

Laboratory General Purpose

Getinge International Inc.

1100 Towbin Ave.

Lakewood, NJ 08701

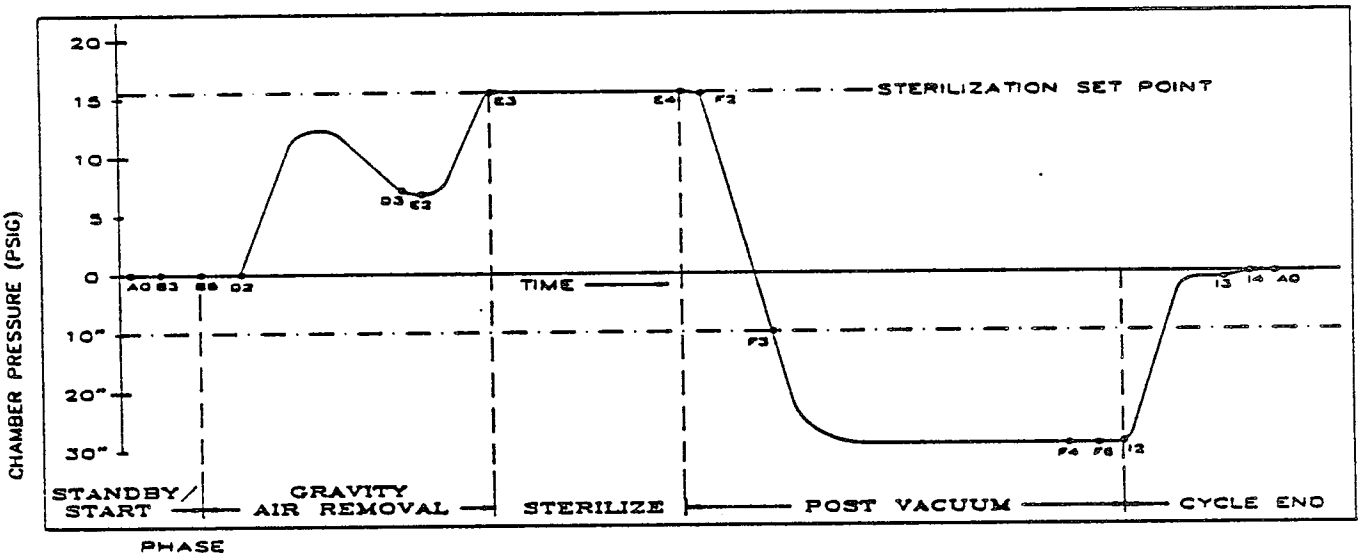
Cycle Graphs And Phase Descriptions

INTRODUCTION: This package contains all necessary information needed to understand the characteristics of a NOVUS I Sterilizer. NOVUS I sterilizers usually have several cycles. These cycles are defined on the following pages by cycle graphs and phase descriptions. The cycle graph depicts pressure as a function of time and separates the various segments of the cycle into phases. Each phase is then further defined by its phase description.

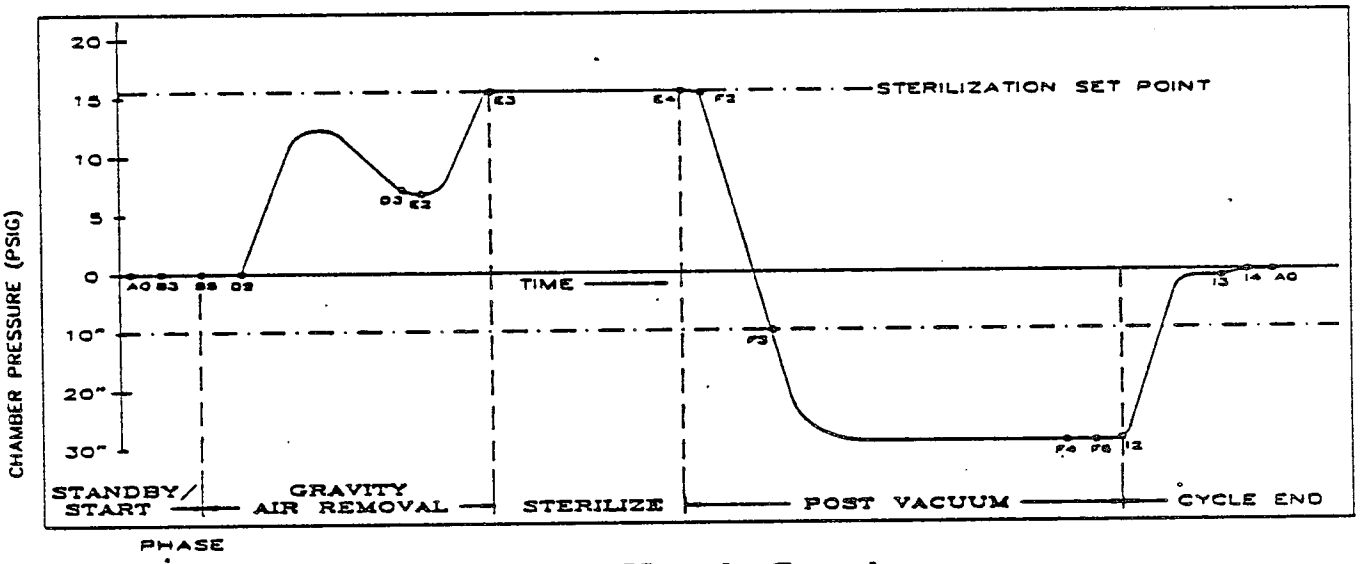
HOW TO USE THIS PACKAGE: Each cycle is divided into phases. The phase is labeled on the lower portion of each cycle graph. Match the phase label to its phase description page in the package. The phase description divides the phase into steps. Each step has a corresponding step number which refers to the actual step number used in the NOVUS I controller. The step number display is enabled by moving the dipswitch on bank 1 pole 1 to the "ON" position. Pressing the service button to the left of the START button will display the step number (see attached service overlay, the button is labeled STEP NO). Each step is then broken down into several divisions. General information and step conditions are described. Energized outputs are indicated by a pin, tag and its description. Pin refers to the number stamped on the controller side of the I/O connector. Tag refers to the label physically attached to the valve, and the description, of course, describes the valve. Time-out and delay times if applicable are indicated. Time-outs occur when step conditions (Sc) are not met within the allotted time.

NOVUS I — LABORATORY GENERAL PURPOSE

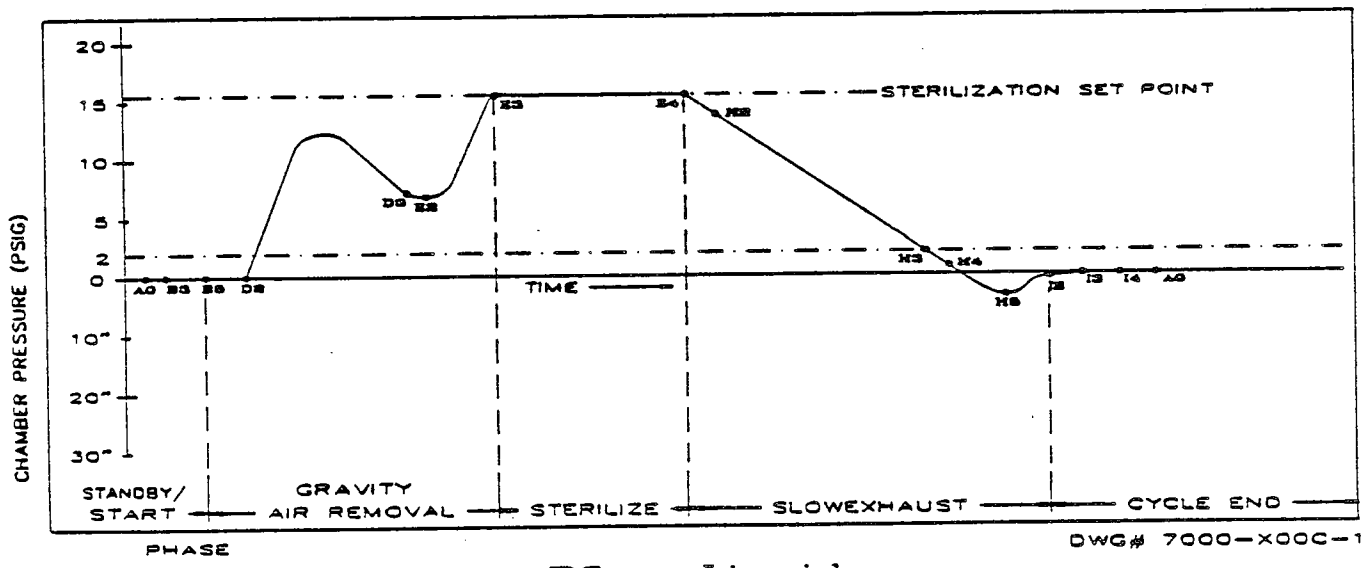
(Refer to phase descriptions for a further explanation of each phase)



P1 — Wrapped Goods



P2 — Hard Goods



P3 — Liquids

Sterilizer type : NOVUS I Standard

Phase Description : STANDBY

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
A0	Init of process.	21c, SV-2, Steam to Jacket* 3c, SV-7, unseal load door 11c, SV-9, unseal unload door**	
	conditions needed to attain start light: - cycle selected - parameters set - all errors cleared - doors OK (input 3a set) - steam generator OK or input 9a made - not in clock set mode - not in jacket set back mode Sc: start light and START button		
	< < < < < < < < < < < < < < < OR > > > > > > > > > > > > > > >		
	Phase Description : JACKET SET BACK STANDBY		
S1	Shut off all outputs		
S2	Turn off jacket regulator		
S3	Check for a new day (12:00pm) Sc: start button***		
S4	Wait Sc: Time of day greater than set ON time or start button pressed***		
S5	Service check****		
S6	Initialize cycles		short time delay

* Regulated using analog input TD-2

** Bioseal units only

*** Pressing the start button will bring the unit back to the regular standby phase. The unit will return to the jacket set back mode

**** Optional equipment which is enabled using dipswitch [1,3].

Sterilizer type : **NOVUS I Standard**

Phase Description : **START**

- START - The unit ensures that doors are closed and that the jacket temperature is near set temperature. Door seal(s) are energized and on ETO units a 20 minute warm-up period is instituted. Should a door not properly close, the jacket not come up to temp, or door seal not properly seal, a timeout will be indicated.

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
B1	Print start text	3c, SV-7, unseal load door 11c, SV-9, unseal unload door* 21c, SV-2, STM to JCKT**	
B2	Doors closed Sc: input 3a (LS-1, LS-2)	3c, SV-7, unseal load door 11c, SV-9, unseal unload door* 21c, SV-2, STM to JCKT**	To: 3 min.
B3	Jacket temp check Sc: TD-2 greater than set STERTEMP - 3.0*c	4c, SV-6, seal load door 12c, SV-8, seal unload door* 21c, SV-2, STM to JCKT**	To: 60 min
B4	Seal door(s)	4c, SV-6, seal load door 12c, SV-8, seal unload door* 21c, SV-2, STM to JCKT**	
B5	Check door seal Sc: input11a(PS-1), input12a(PS-2)*	4c, SV-6, seal load door 12c, SV-8, seal unload door* 21c, SV-2, STM to JCKT**	Delay: 5 sec To: 60 sec
B6	ETO only warm up chamber	4c, SV-6, seal load door 12c, SV-8, seal unload door* 21c, SV-2, STM to JCKT**	Delay: 20 min

* Bioseal units only

** Regulated using analog input TD-2

Sterilizer type : **NOVUS I Standard**

Phase Description : **GRAVITY AIR REMOVAL**

- AIR REMOVAL - Steam is admitted to the chamber forcing air and condensate through the chamber drain until saturated steam conditions are attained (ie. temperature correlates with pressure), at which point the drain vent valve closes.

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
D1	Initialize	5c,SV-10, pump ** 7c, SV-1, Steam to chamber *** 8c, SV-4, Chamber drain *	
D2	Check for air Sc: pressure, temperature correlation or time ****	5c,SV-10, pump ** 7c, SV-1, Steam to chamber *** 8c,SV-4, Chamber drain *	
D3	time delay *	5c,SV-10, pump ** 7c, SV-1, Steam to chamber *** 8c, SV-4, Chamber drain	Delay:15 sec
D4	close valves	7c, SV-1, Steam to chamber *** *	
D5	next phase		

* Outputs which are always on during this step

4c, SV-6, seal load door
12c, SV-8, seal unload door (Bioseal units)
21c, SV-2, STM to JCKT(regulated using TD-2)

** except on Hi Vac units

*** Regulated using analog input TD-1

**** 75 seconds on FLASH cycles, 5 minutes on all other cycles.

Sterilizer type : NOVUS I Standard

Phase Description : STERILIZE

- STERILIZING - Steam is admitted to the chamber until the selected temperature is attained (100-135 *C). Sterilizing exposure may be selected by overkill time (0-999.0 minutes). Alarms, to alert the operator, are furnished for 1 *C low temperature.

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
E1	start steam regulator	7c, SV-1, stm to chmbr** *	
E2	Come-up Sc: Temp limit ***	7c, SV-1, stm to chmbr** 22c,SV-5a, trap valve *	
E3	Sterilization (4) Sc: Temp limit	7c, SV-1, stm to chmbr** 22c,SV-5a, trap valve *	Delay stertime To: stertime + 2 min
E4	Close valves	*	
E5	Select post vacuum	*	

* Outputs which are always on during this step

4c, SV-6, seal load door
12c, SV-8, seal unload door (Bioseal units)
21c, SV-2, STM to JCKT(regulated using TD-2)

** Regulated using analog input TD-1

*** Temp limit = Chambtemp and Loadtemp(s) higher than Stertemp-1.

(4) Timeout during Sterilization: The Stertime is accumulated whenever the templimit is OK. If the temperature is too low for the amount more than 2 minutes, timeout will be indicated.

Sterilizer type : **NOVUS I Standard**

Phase Description : **POST VACUUM**

- POST CONDITIONING (Drying) - Steam is removed from the chamber and load by the vacuum pumping system. When a suitable vacuum has been achieved, a timer will be energized to hold the chamber under vacuum conditions for the set time (0 - 999.0 minutes), to ensure dryness of the load.

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
F1	Exhaust chamber	5c, SV-10, pump 8c, SV-4, fast exhaust *	
F2	Check pressure Sc: pressure under limit **	5c, SV-10, pump 8c, SV-4, fast exhaust *	
F3	Hold for set drytime	5c,SV-10, pump 8c,SV-4, fast exhaust *	Delay:drytime To:drytime + 1 min**
F4	Close fast exhaust	5c,SV-10, pump *	Delay: 10 sec
F5	Turn off pump	*	
F6	Turn on air filter	6c,SV-3, air filter *	Delay: 20 sec
F7	. Select end	6c,SV-3, air filter *	

* Outputs which are always on during this step

4c, SV-6,seal load door
12c, SV-8,seal unload door (Bioseal units)
21c, SV-2,STM to JCKT(regulated using TD-2)

** Drytime is accumulated when pressure is less than 10 PSIA. In the case of an abort pressure must be less than 1 PSIG.

Sterilizer type : **NOVUS I Standard**

Phase Description : **SLOW EXHAUST**

- POST CONDITIONING (Cooling) - Steam is removed from the chamber by controlled venting from the chamber drain to prevent excessive boil off of liquids. The venting rate is programmable through the service mode (preset at factory for optimal results). When 5" Hg pressure is attained in the chamber or the drain temperature is below boiling point, the "cooling" phase is completed.

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
H1	start drain regulator	8c, SV-4, fast exhaust ** *	
H2	Check pressure Sc: pressure under 2 PSIG	8c, SV-4, fast exhaust ** *	To: 90 min
H3	stop Drain regulator start trap regulator	5c,SV-10, pump 22c,SV-5a, trap **	
H4	Check temp and pressure Sc: temp limit*** or pressure less 5" Hg	5c, SV-10, pump 22c, SV-5a, trap** *	
H5	Stop Trap regulator Turn on air filter	5c,SV-10, pump 6c,SV-3, air filter *	Delay: 10 sec
H6	Turn off pump	6c,SV-3, air filter *	
H7	Admit air	6c,SV-3, air filter *	Delay: 20 sec
H8	Select end	6c,SV-3, air filter *	

* Outputs which are always on during this step

4c, SV-6, seal load door
12c, SV-8, seal unload door (Bioseal units)
21c, SV-2, STM to JCKT(regulated using TD-2)

** Regulated using analog input PT-1

*** Temp limit = Chambtemp and Loadtemp(s) less than boiling point - 2.0 *C

Sterilizer type : **NOVUS I Standard**

Phase Description : **CYCLE END**

- CYCLE END - At completion of the drying time, the vacuum system is terminated and filtered air admitted to the chamber until atmospheric pressure is attained.

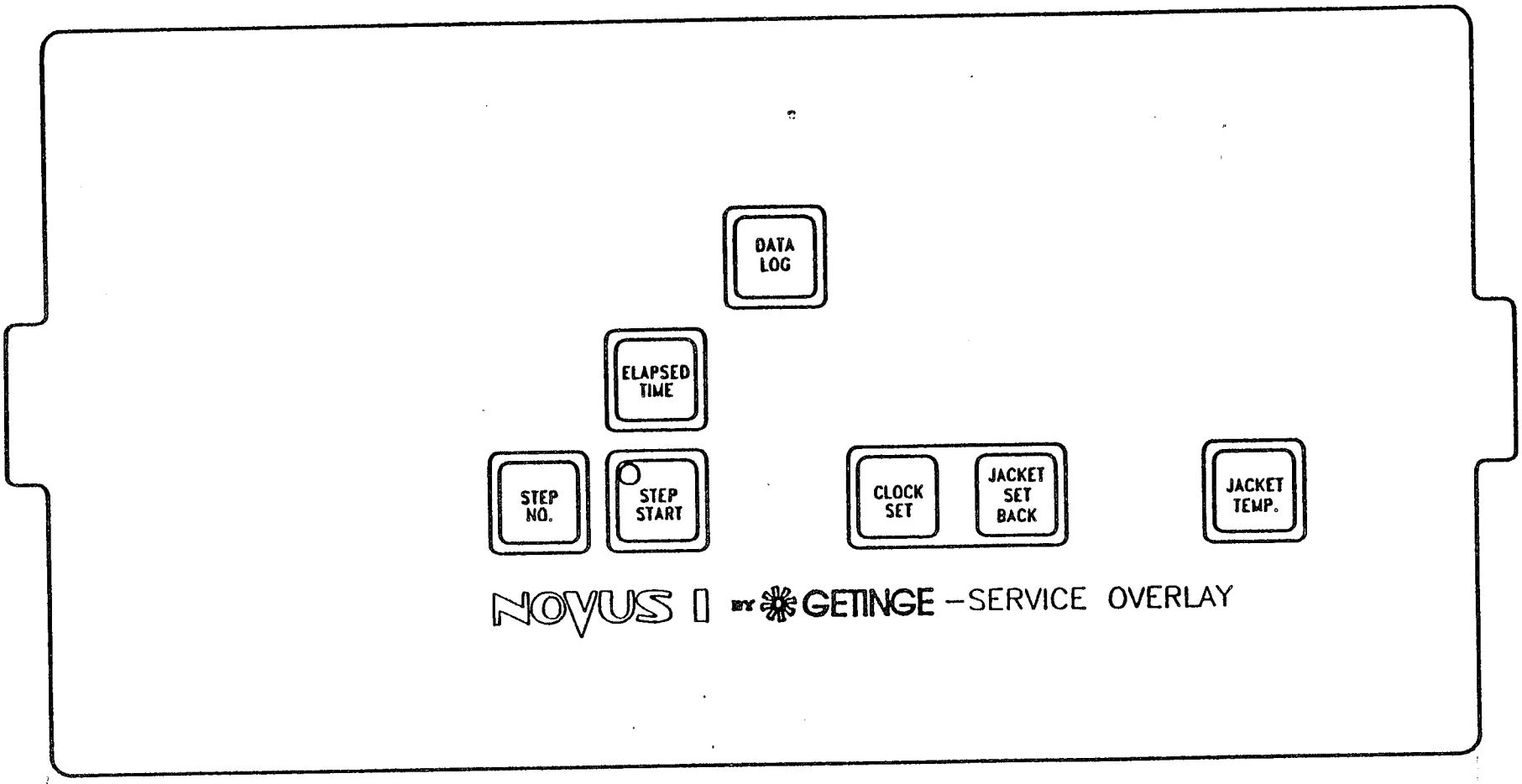
Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
I1	Initialize end phase	6c,SV-3, air filter *	
I2	Check pressure Sc: pressure less than 1.0 PSIG	6c,SV-3, air filter *	
I3	Auto blow down	6c,SV-3, air filter 14c,EBV-14, autoblowdown *	Delay: 6 sec
I4	Pull seal ***	6c,SV-3, air filter 3c,SV-7, unseal load door 5c,SV-10, pump	Delay: 1 min**
I5	Select door sequence		

* Outputs which are always on during this step

4c, SV-6,seal load door
12c, SV-8,seal unload door (Bioseal units)
21c, SV-2,STM to JCKT(regulated using TD-2)

** 30 seconds on FLASH cycles.

*** bioseal units skip this step.


DATA LOG
ELAPSED TIME
STEP NO.
STEP START
CLOCK SET
JACKET SET BACK
JACKET TEMP.
NOVUS I BY GETINGE – SERVICE OVERLAY

NOVUS I STERILIZERS

Laboratory Low Temperature

Getinge International Inc.

1100 Towbin Ave.

Lakewood, NJ 08701

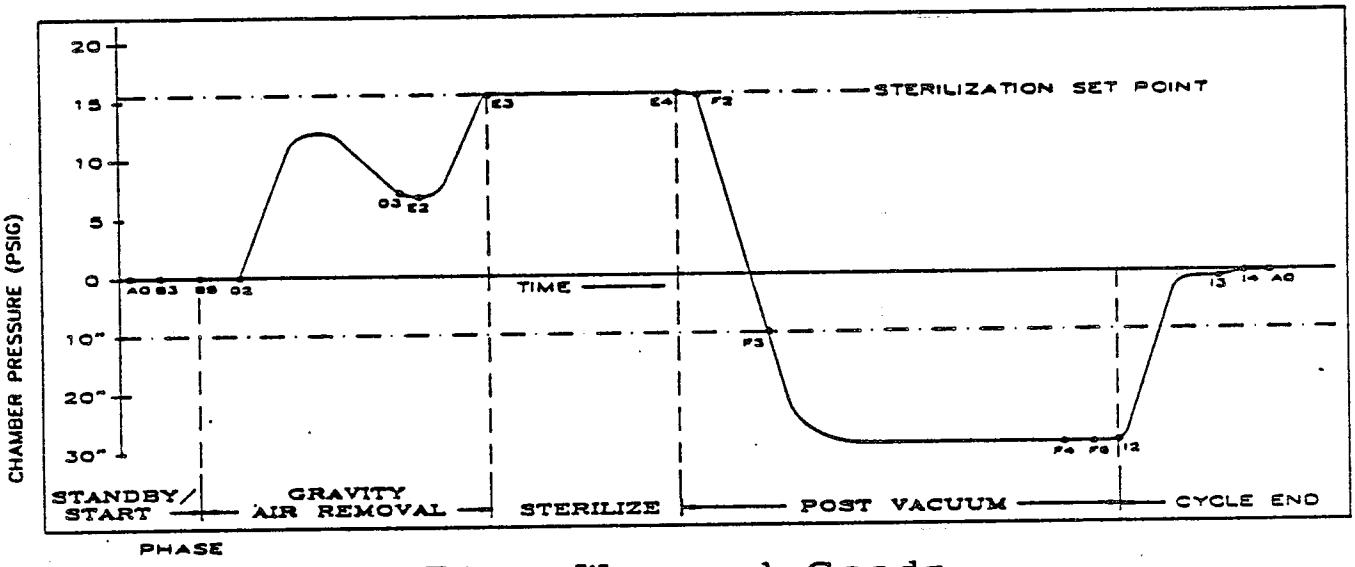
Cycle Graphs And Phase Descriptions

INTRODUCTION: This package contains all necessary information needed to understand the characteristics of a NOVUS I Sterilizer. NOVUS I sterilizers usually have several cycles. These cycles are defined on the following pages by cycle graphs and phase descriptions. The cycle graph depicts pressure as a function of time and separates the various segments of the cycle into phases. Each phase is then further defined by its phase description.

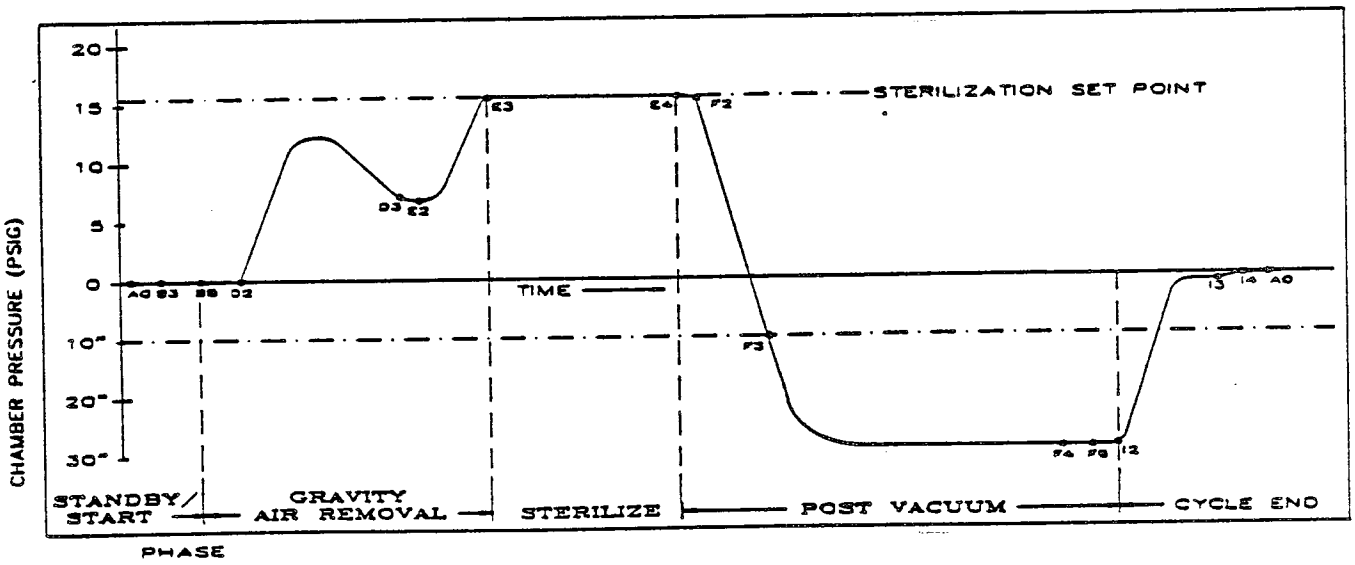
HOW TO USE THIS PACKAGE: Each cycle is divided into phases. The phase is labeled on the lower portion of each cycle graph. Match the phase label to its phase description page in the package. The phase description divides the phase into steps. Each step has a corresponding step number which refers to the actual step number used in the NOVUS I controller. The step number display is enabled by moving the dipswitch on bank 1 pole 1 to the "ON" position. Pressing the service button to the left of the START button will display the step number (see attached service overlay, the button is labeled STEP NO). Each step is then broken down into several divisions. General information and step conditions are described. Energized outputs are indicated by a pin, tag and its description. Pin refers to the number stamped on the controller side of the I/O connector. Tag refers to the label physically attached to the valve, and the description, of course, describes the valve. Time-out and delay times if applicable are indicated. Time-outs occur when step conditions (Sc) are not met within the allotted time.

NOVUS — I LABORATORY LOW TEMPERATURE

(Refer to phase descriptions for a further explanation of each phase)



P1 — Wrapped Goods

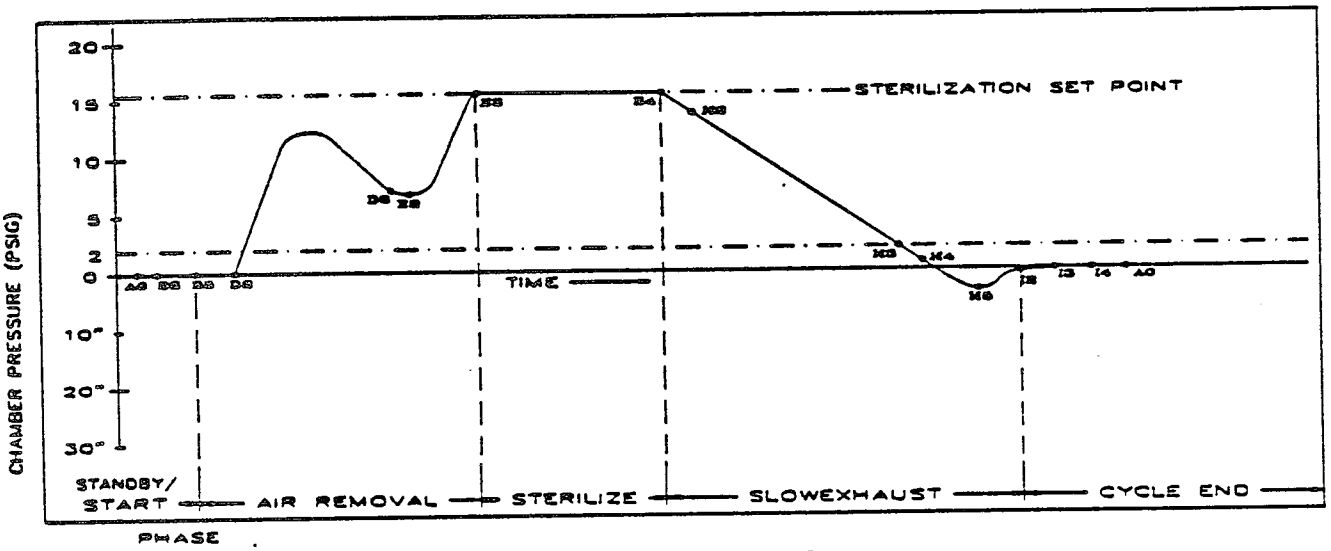


P2 — Hard Goods

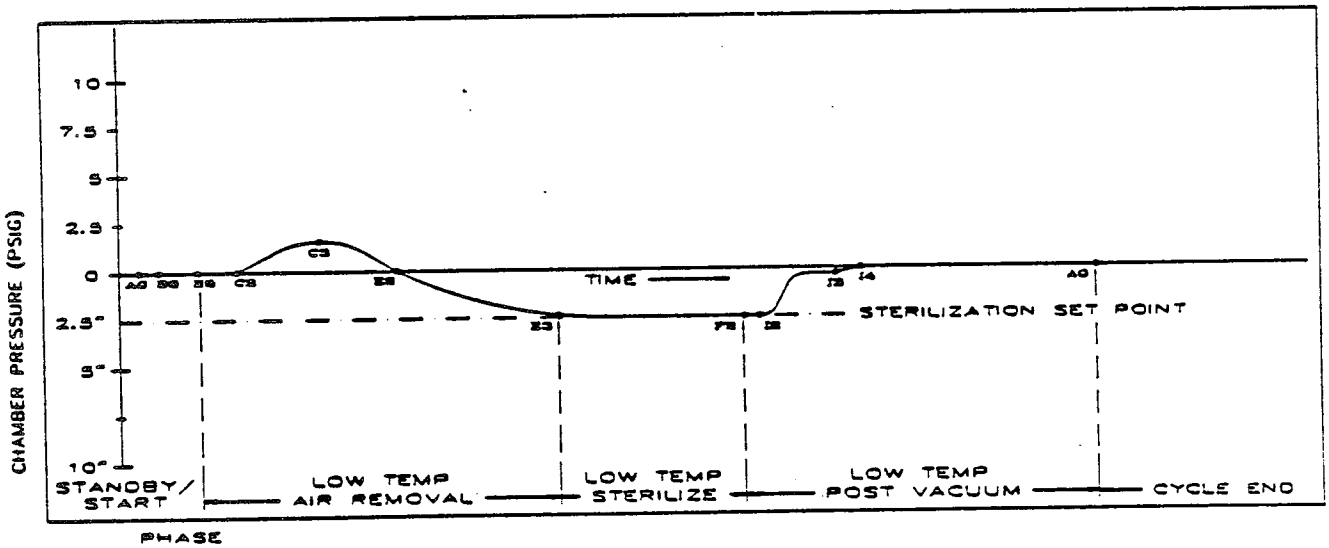
DWG# 7003-X00C-1

NOVUS — I LABORATORY LOW TEMPERATURE

(Refer to phase descriptions for a further explanation of each phase)



P3 — Liquids



P4 — Low Temperature Sterilization

DWG# 7003-X00C-2

	Sterilizer type :	**NOVUS I Standard**	
	Phase Description :	**STANDBY**	
Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
A0	Init of process.	21c, SV-2, Steam to Jacket* 3c, SV-7, unseal load door 11c, SV-9, unseal unload door**	
	conditions needed to attain start light: - cycle selected - parameters set - all errors cleared - doors OK (input 3a set) - steam generator OK or input 9a made - not in clock set mode - not in jacket set back mode Sc: start light and START button		
	< < < < < < < < < < < < < < < OR > > > > > > > > > > > > > > >		
	Phase Description :	**JACKET SET BACK STANDBY**	
S1	Shut off all outputs		
S2	Turn off jacket regulator		
S3	Check for a new day (12:00pm) Sc: start button***		
S4	Wait Sc: Time of day greater than set ON time or start button pressed***		
S5	Service check****		
S6	Initialize cycles		short time delay

* Regulated using analog input TD-2

** Bioseal units only

*** Pressing the start button will bring the unit back to the regular standby phase. The unit will return to the jacket set back mode

**** Optional equipment which is enabled using dipswitch [1,3].

Sterilizer type : **NOVUS I Standard**

Phase Description : **START**

- START - The unit ensures that doors are closed and that the jacket temperature is near set temperature. Door seal(s) are energized and on ETO units a 20 minute warm-up period is instituted. Should a door not properly close, the jacket not come up to temp, or door seal not properly seal, a timeout will be indicated.

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
B1	Print start text	3c, SV-7, unseal load door 11c, SV-9, unseal unload door* 21c, SV-2, STM to JCKT**	
B2	Doors closed Sc: input 3a (LS-1, LS-2)	3c, SV-7, unseal load door 11c, SV-9, unseal unload door* 21c, SV-2, STM to JCKT**	To: 3 min.
B3	Jacket temp check Sc: TD-2 greater than set STERTEMP - 3.0*c	4c, SV-6, seal load door 12c, SV-8, seal unload door* 21c, SV-2, STM to JCKT**	To: 60 min
B4	Seal door(s)	4c, SV-6, seal load door 12c, SV-8, seal unload door* 21c, SV-2, STM to JCKT**	
B5	Check door seal Sc: input11a(PS-1), input12a(PS-2)*	4c, SV-6, seal load door 12c, SV-8, seal unload door* 21c, SV-2, STM to JCKT**	Delay: 5 sec To: 60 sec
B6	ETO only warm up chamber	4c, SV-6, seal load door 12c, SV-8, seal unload door* 21c, SV-2, STM to JCKT**	Delay: 20 min

* Bioseal units only

** Regulated using analog input TD-2

Sterilizer type : **NOVUS I Standard**

Phase Description : **GRAVITY AIR REMOVAL**

- AIR REMOVAL - Steam is admitted to the chamber forcing air and condensate through the chamber drain until saturated steam conditions are attained (ie. temperature correlates with pressure), at which point the drain vent valve closes.

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
D1	Initialize	5c,SV-10, pump ** 7c, SV-1, Steam to chamber *** 8c, SV-4, Chamber drain *	
D2	Check for air Sc: pressure, temperature correlation or time ****	5c,SV-10, pump ** 7c, SV-1, Steam to chamber *** 8c,SV-4, Chamber drain *	
D3	time delay *	5c,SV-10, pump ** 7c, SV-1, Steam to chamber *** 8c, SV-4, Chamber drain	Delay:15 sec
D4	close valves	7c, SV-1, Steam to chamber *** *	
D5	next phase		

* Outputs which are always on during this step

4c, SV-6, seal load door
12c, SV-8, seal unload door (Bioseal units)
21c, SV-2, STM to JCKT(regulated using TD-2)

** except on Hi Vac units

*** Regulated using analog input TD-1

**** 75 seconds on FLASH cycles, 5 minutes on all other cycles.

Sterilizer type : **NOVUS I Standard**

Phase Description : **LOW TEMP PREVACUUM**

- LOW TEMP PREVACUUM - Steam is admitted and the exhaust valve open such that a slight vacuum is created. This condition is held for a set period of time.

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
C1	Initialize	*	
C2	Turn on steam	16c,SV-15, steam to ejector ** 8c, SV-4, fast exhaust 5c, SV-10, pump *	Delay:10 sec
C3	Pull slight vacuum Sc: pressure lessan than 0 psig	16c,SV-15, steam to ejector ** 8c, SV-4, fast exhaust 5c, SV-10, pump 13c,SV-3b, air admission *	To: 30 min
C4	Hold	16c,SV-15, steam to ejector ** 8c, SV-4, fast exhaust 5c, SV-10, pump 13c,SV-3b, air admission *	delay:30 sec
C5	Select low steril		

* Outputs which are always on during this step

4c, SV-6, seal load door
12c, SV-8, seal unload door (Bioseal units)
21c, SV-2, STM to JCKT (regulated using TD-2)

** Regulated using analog input TD-6

Sterilizer type : **NOVUS I Standard**

Phase Description : **STERILIZE**

- STERILIZING - Steam is admitted to the chamber until the selected temperature is attained (100-135 *C). Sterilizing exposure may be selected by overkill time (0-999.0 minutes). Alarms, to alert the operator, are furnished for 1 *C low temperature.

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
E1	start steam regulator	7c, SV-1, stm to chmbr** *	
E2	Come-up Sc: Temp limit ***	7c, SV-1, stm to chmbr** 22c,SV-5a, trap valve *	
E3	Sterilization (4) Sc: Temp limit	7c, SV-1, stm to chmbr** 22c,SV-5a, trap valve *	Delay stertime To: stertime + 2 min
E4	Close valves	*	
E5	Select post vacuum	*	

* Outputs which are always on during this step

4c, SV-6, seal load door
12c, SV-8, seal unload door (Bioseal units)
21c, SV-2, STM to JCKT(regulated using TD-2)

** Regulated using analog input TD-1

*** Temp limit = Chambtemp and Loadtemp(s) higher than Stertemp-1.

(4) Timeout during Sterilization: The Stertime is accumulated whenever the templimit is OK. If the temperature is too low for the amount more than 2 minutes, timeout will be indicated.

Sterilizer type : **NOVUS I Standard**

Phase Description : **LOW TEMP STERILIZE**

STERILIZING - Steam is admitted to the chamber until the selected temperature is attained (70 - 90 *C). Sterilizing exposure may be selected by overkill time (0 - 999.0 minutes). Alarms, to alert the operator, are furnished for 1 *C low temperature.

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
E1	Initialize	16c,SV-15, steam to ejector ** 8c, SV-4, fast exhaust 5c, SV-10, pump 13c,SV-3b, air admission *	
E2	Come up Sc: Temp limit ***	16c,SV-15, steam to ejector ** 8c, SV-4, fast exhaust 5c, SV-10, pump 13c,SV-3b, air admission *	To: 2 hrs
E3	Sterilize (4)	16c,SV-15, steam to ejector ** 8c, SV-4, fast exhaust 5c, SV-10, pump 13c,SV-3b, air admission *	Delay : stertime
E4	turn off outputs	*	

* Outputs which are always on during this step

4c, SV-6,seal load door
12c, SV-8,seal unload door (Bioseal units)
21c, SV-2,STM to JCKT(regulated using TD-2)

** Regulated using analog input TD-6

*** Temp limit = Loadtemp (TD-6) higher than Stertemp-1.

(4) Timeout during Sterilization: The Stertime is accumulated whenever the temp limit is OK. If the temperature falls 2 *C below sterilization setpoint for more than 2 minutes, timeout will be indicated.

Sterilizer type : **NOVUS I Standard**

Phase Description : **POST VACUUM**

- POST CONDITIONING (Drying) - Steam is removed from the chamber and load by the vacuum pumping system. When a suitable vacuum has been achieved, a timer will be energized to hold the chamber under vacuum conditions for the set time (0 - 999.0 minutes), to ensure dryness of the load.

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
F1	Exhaust chamber	5c, SV-10, pump 8c, SV-4, fast exhaust *	
F2	Check pressure Sc: pressure under limit **	5c, SV-10, pump 8c, SV-4, fast exhaust *	
F3	Hold for set drytime	5c,SV-10, pump 8c,SV-4, fast exhaust *	Delay:drytime To:drytime + 1 min**
F4	Close fast exhaust	5c,SV-10, pump *	Delay: 10 sec
F5	Turn off pump	*	
F6	Turn on air filter	6c,SV-3, air filter *	Delay: 20 sec
F7	. Select end	6c,SV-3, air filter *	

* Outputs which are always on during this step

4c, SV-6,seal load door
12c, SV-8,seal unload door (Bioseal units)
21c, SV-2,STM to JCKT(regulated using TD-2)

** Drytime is accumulated when pressure is less than 10 PSIA. In the case of an abort pressure must be less than 1 PSIG.

Sterilizer type : **NOVUS I Standard**

Phase Description : **LOW TEMP POST VACUUM**

- LOW TEMP POSTVACUUM - Filtered air is admitted and the vacuum in the chamber is relieved.

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
F1	Initialize	6c, SV-3, air filter *	
F2	Admit air	6c, SV-3, air filter *	delay: 10 sec
F3	next phase	6c, SV-3, air filter *	

* Outputs which are always on during this step

4c, SV-6, seal load door
12c, SV-8, seal unload door (Bioseal units)
21c, SV-2, STM to JCKT(regulated using TD-2)

Sterilizer type : **NOVUS I Standard**

Phase Description : **SLOW EXHAUST**

- POST CONDITIONING (Cooling) - Steam is removed from the chamber by controlled venting from the chamber drain to prevent excessive boil off of liquids. The venting rate is programmable through the service mode (preset at factory for optimal results). When 5" Hg pressure is attained in the chamber or the drain temperature is below boiling point, the "cooling" phase is completed.

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
H1	start drain regulator	8c, SV-4, fast exhaust ** *	
H2	Check pressure Sc: pressure under 2 PSIG	8c, SV-4, fast exhaust ** *	To: 90 min
H3	stop Drain regulator start trap regulator	5c,SV-10, pump 22c,SV-5a, trap **	
H4	Check temp and pressure Sc: temp limit*** or pressure less 5" Hg	5c, SV-10, pump 22c, SV-5a, trap** *	
H5	Stop Trap regulator Turn on air filter	5c,SV-10, pump 6c,SV-3, air filter *	Delay: 10 sec
H6	Turn off pump	6c,SV-3, air filter *	
H7	Admit air	6c,SV-3, air filter *	Delay: 20 sec
H8	Select end	6c,SV-3, air filter *	

* Outputs which are always on during this step

4c, SV-6, seal load door
12c, SV-8, seal unload door (Bioseal units)
21c, SV-2, STM to JCKT(regulated using TD-2)

** Regulated using analog input PT-1

*** Temp limit = Chambtemp and Loadtemp(s) less than boling point - 2.0 *C

Sterilizer type : **NOVUS I Standard**

Phase Description : **CYCLE END**

- CYCLE END - At completion of the drying time, the vacuum system is terminated and filtered air admitted to the chamber until atmospheric pressure is attained.

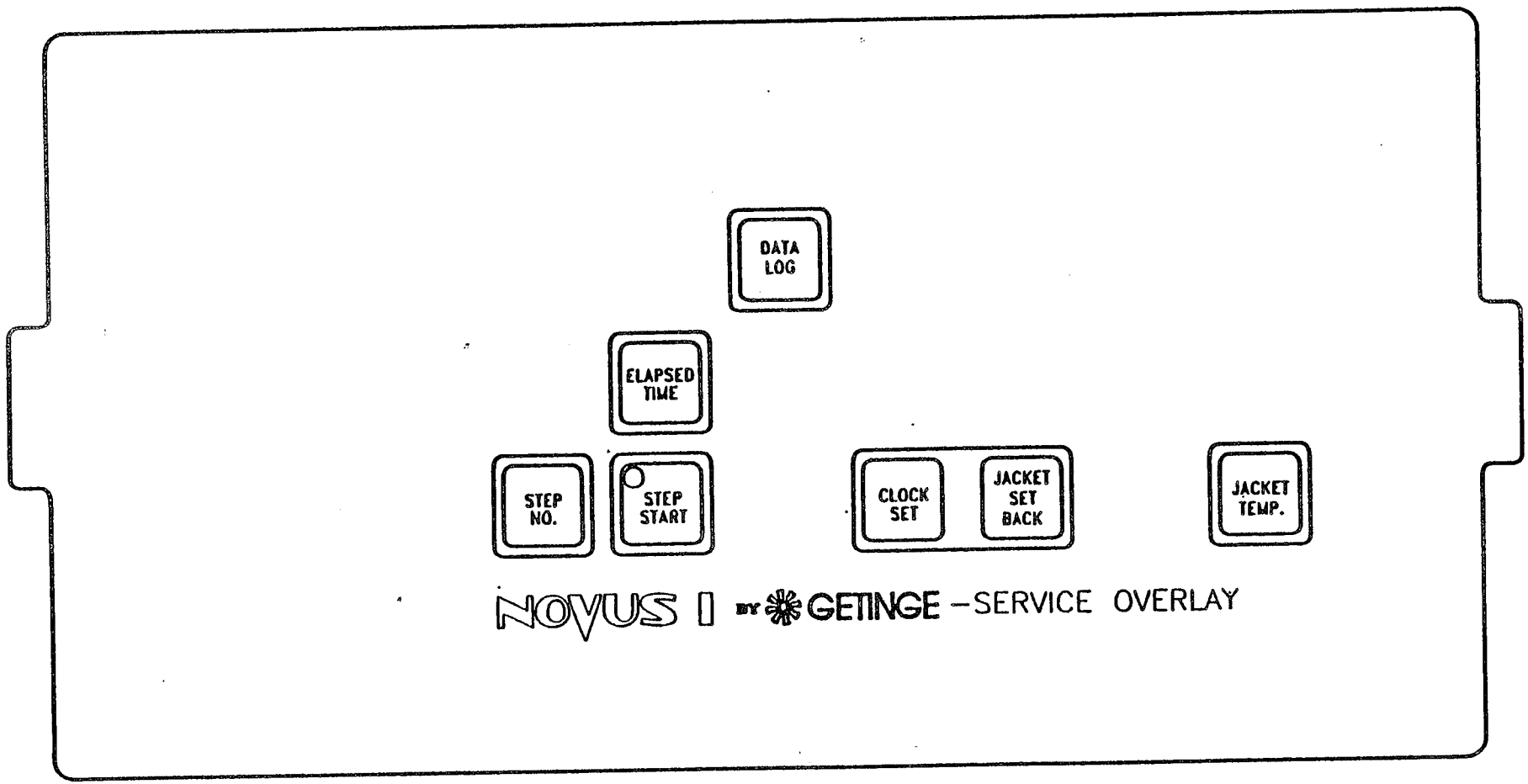
Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
I1	Initialize end phase	6c,SV-3, air filter *	
I2	Check pressure Sc: pressure less than 1.0 PSIG	6c,SV-3, air filter *	
I3	Auto blow down	6c,SV-3, air filter 14c,EBV-14, autoblowdown *	Delay: 6 sec
I4	Pull seal ***	6c,SV-3, air filter 3c,SV-7, unseal load door 5c,SV-10, pump	Delay: 1 min**
I5	Select door sequence		

* Outputs which are always on during this step

4c, SV-6,seal load door
12c, SV-8,seal unload door (Bioseal units)
21c, SV-2,STM to JCKT(regulated using TD-2)

** 30 seconds on FLASH cycles.

*** bioseal units skip this step.


DATA LOG
ELAPSED TIME
STEP NO.
STEP START
CLOCK SET
JACKET SET BACK
JACKET TEMP.
NOVUS I BY GETINGE – SERVICE OVERLAY

NOVUS I STERILIZERS

Laboratory Vacuum

Getinge International Inc.

1100 Towbin Ave.

Lakewood, NJ 08701

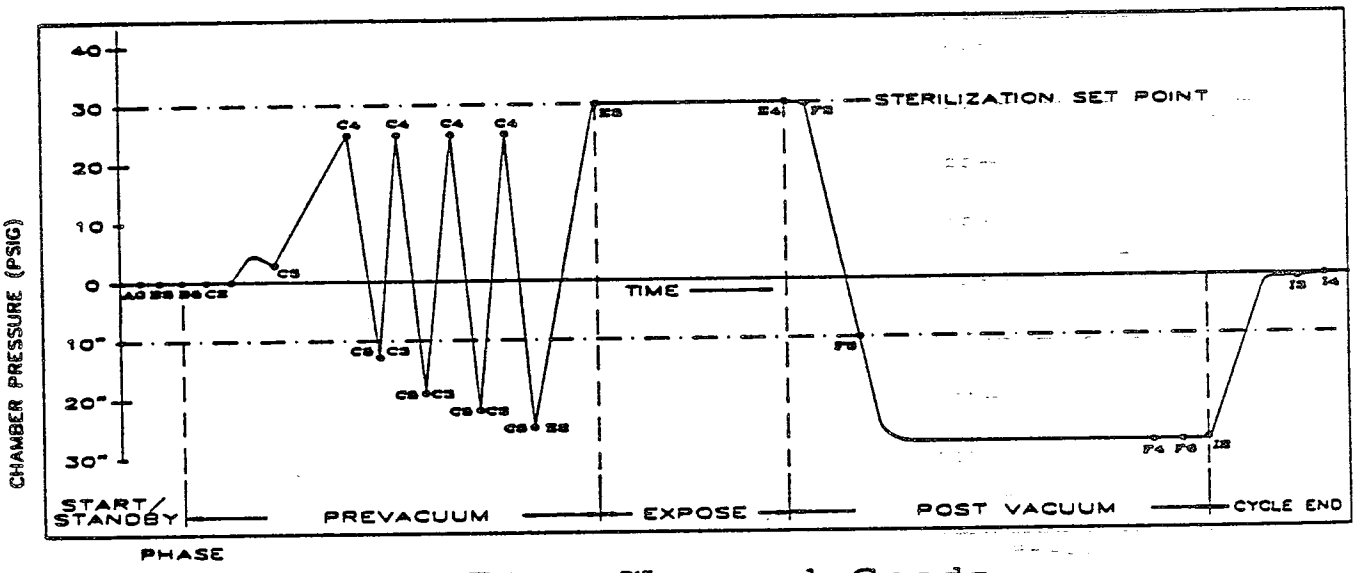
Cycle Graphs And Phase Descriptions

INTRODUCTION: This package contains all necessary information needed to understand the characteristics of a NOVUS I Sterilizer. NOVUS I sterilizers usually have several cycles. These cycles are defined on the following pages by cycle graphs and phase descriptions. The cycle graph depicts pressure as a function of time and separates the various segments of the cycle into phases. Each phase is then further defined by its phase description.

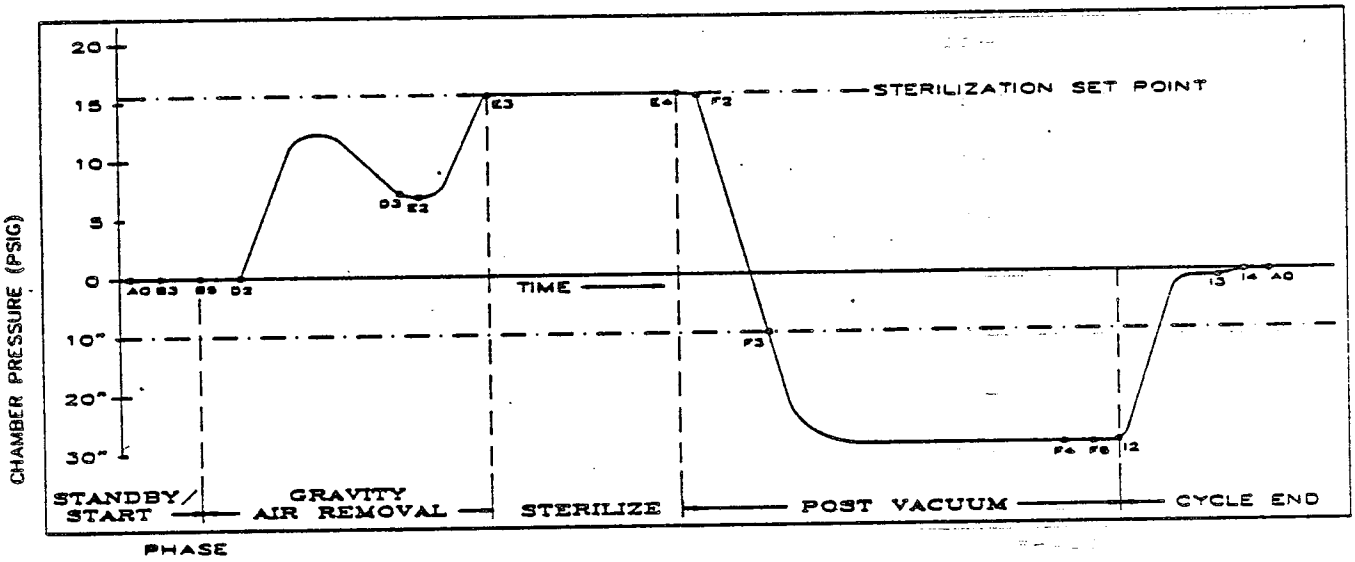
HOW TO USE THIS PACKAGE: Each cycle is divided into phases. The phase is labeled on the lower portion of each cycle graph. Match the phase label to its phase description page in the package. The phase description divides the phase into steps. Each step has a corresponding step number which refers to the actual step number used in the NOVUS I controller. The step number display is enabled by moving the dipswitch on bank 1 pole 1 to the "ON" position. Pressing the service button to the left of the START button will display the step number (see attached service overlay, the button is labeled STEP NO). Each step is then broken down into several divisions. General information and step conditions are described. Energized outputs are indicated by a pin, tag and its description. Pin refers to the number stamped on the controller side of the I/O connector. Tag refers to the label physically attached to the valve, and the description, of course, describes the valve. Time-out and delay times if applicable are indicated. Time-outs occur when step conditions (Sc) are not met within the allotted time.

NOVUS I — LABORATORY VACUUM

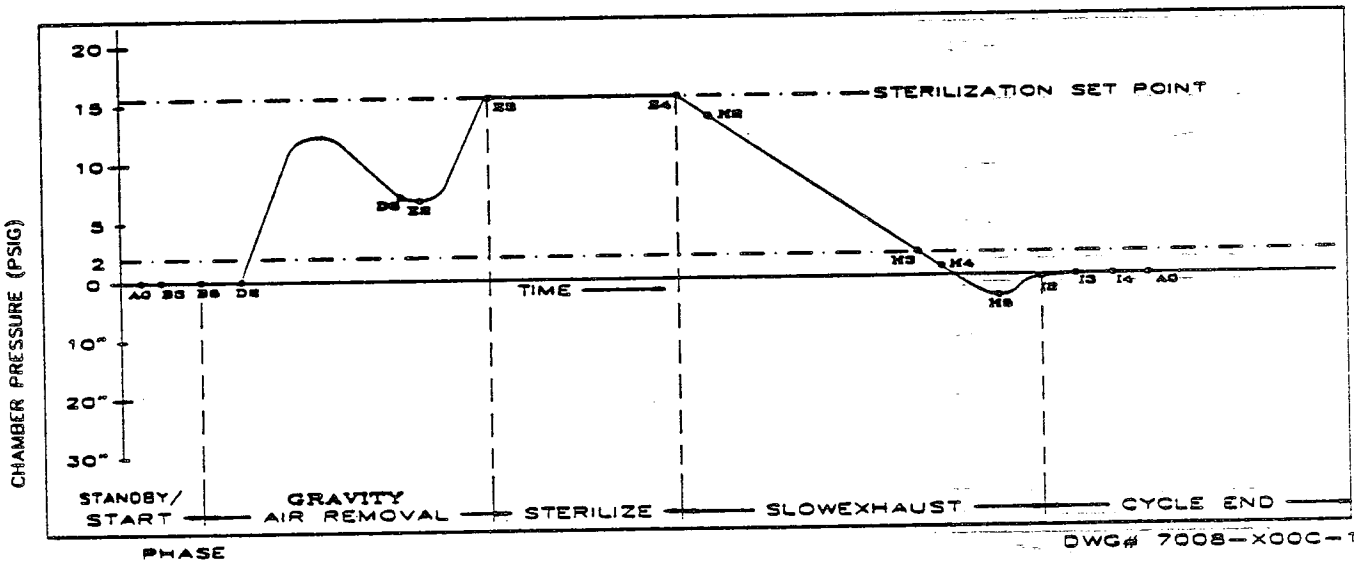
(Refer to phase descriptions for a further explanation of each phase)



P1 — Wrapped Goods



P2 — Hard Goods



P3 — Liquids

	Sterilizer type :	**NOVUS I Standard**	
	Phase Description :	**STANDBY**	
Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
A0	Init of process.	21c, SV-2, Steam to Jacket* 3c, SV-7, unseal load door 11c, SV-9, unseal unload door**	
	conditions needed to attain start light: - cycle selected - parameters set - all errors cleared - doors OK (input 3a set) - steam generator OK or input 9a made - not in clock set mode - not in jacket set back mode Sc: start light and START button		
	< < < < < < < < < < < < < < < OR > > > > > > > > > > > > > > >		
	Phase Description :	**JACKET SET BACK STANDBY**	
S1	Shut off all outputs		
S2	Turn off jacket regulator		
S3	Check for a new day (12:00pm) Sc: start button***		
S4	Wait Sc: Time of day greater than set ON time or start button pressed***		
S5	Service check****		
S6	Initialize cycles		short time delay

* Regulated using analog input TD-2

** Bioseal units only

*** Pressing the start button will bring the unit back to the regular standby phase. The unit will return to the jacket set back mode

**** Optional equipment which is enabled using dipswitch [1,3].

Sterilizer type : NOVUS I Standard

Phase Description : START

- START - The unit ensures that doors are closed and that the jacket temperature is near set temperature. Door seal(s) are energized and on ETO units a 20 minute warm-up period is instituted. Should a door not properly close, the jacket not come up to temp, or door seal not properly seal, a timeout will be indicated.

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
B1	Print start text	3c, SV-7, unseal load door 11c, SV-9, unseal unload door* 21c, SV-2, STM to JCKT**	
B2	Doors closed Sc: input 3a (LS-1, LS-2)	3c, SV-7, unseal load door 11c, SV-9, unseal unload door* 21c, SV-2, STM to JCKT**	To: 3 min.
B3	Jacket temp check Sc: TD-2 greater than set STERTEMP - 3.0*c	4c, SV-6, seal load door 12c, SV-8, seal unload door* 21c, SV-2, STM to JCKT**	To: 60 min
B4	Seal door(s)	4c, SV-6, seal load door 12c, SV-8, seal unload door* 21c, SV-2, STM to JCKT**	
B5	Check door seal Sc: input11a(PS-1), input12a(PS-2)*	4c, SV-6, seal load door 12c, SV-8, seal unload door* 21c, SV-2, STM to JCKT**	Delay: 5 sec To: 60 sec
B6	ETO only warm up chamber	4c, SV-6, seal load door 12c, SV-8, seal unload door* 21c, SV-2, STM to JCKT**	Delay: 20 min

* Bioseal units only

** Regulated using analog input TD-2

Sterilizer type : NOVUS I Standard

Phase Description : PREVACUUM

- AIR REMOVAL - During the air removal stage of the cycle, air is removed by the vacuum pump for a predetermined length of time, steam is pulsed into the chamber to mix intimately with the residual air. The air/steam mixture is removed by the vacuum pumping system. The steam pulses with vacuum continues for a set number of excursions, ensuring optimum air removal.

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
c1.	Initialize	*	
c2	Gravity air removal (on first pulse only)	7c, SV-1, steam to chamber 8c, SV-4, fast exhaust 5c, SV-10, pump *	Delay:1.5 min
c3	Pressurize w/ steam Sc: pressure greater than 25 psig or CHAMB TEMP > set STER TEMP	7c, SV-1, steam to chamber *	
c4	Exhaust of steam/air mixture	5c, SV-10, pump 8c, SV-4, fast exhaust *	Delay:**
c5	Close fast exhaust	5c, SV-10, pump *	Delay:10 sec
c6	Turn off pump	*	

Repeat steps c1 - c6 three more times for a total of four pulses

* Outputs which are always on during this step

4c, SV-6, seal load door
12c, SV-8, seal unload door (Bioseal units)
21c, SV-2, STM to JCKT(regulated using TD-2)

** Delay time is dependant upon pulse number

PULSE	DELAY (MINUTES)
1,2	1
3,4	2

(NOTE: A QUICK cycle does 2 pulses only, 1 minute on the first, and 2 minutes on the second)

Sterilizer type : **NOVUS I Standard**

Phase Description : **GRAVITY AIR REMOVAL**

- AIR REMOVAL - Steam is admitted to the chamber forcing air and condensate through the chamber drain until saturated steam conditions are attained (ie. temperature correlates with pressure), at which point the drain vent valve closes.

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
D1	Initialize	5c,SV-10, pump ** 7c, SV-1, Steam to chamber *** 8c, SV-4, Chamber drain *	
D2	Check for air Sc: pressure, temperature correlation or time ****	5c,SV-10, pump ** 7c, SV-1, Steam to chamber *** 8c,SV-4, Chamber drain *	
D3	time delay	5c,SV-10, pump ** 7c, SV-1, Steam to chamber *** 8c, SV-4, Chamber drain *	Delay:15 sec
D4	close valves	7c, SV-1, Steam to chamber *** *	
D5	next phase		

* Outputs which are always on during this step

4c, SV-6, seal load door
12c, SV-8, seal unload door (Bioseal units)
21c, SV-2, STM to JCKT(regulated using TD-2)

** except on Hi Vac units

*** Regulated using analog input TD-1

**** 75 seconds on FLASH cycles, 5 minutes on all other cycles.

Sterilizer type : NOVUS I Standard

Phase Description : STERILIZE

- STERILIZING - Steam is admitted to the chamber until the selected temperature is attained (100-135 *C). Sterilizing exposure may be selected by overkill time (0-999.0 minutes). Alarms, to alert the operator, are furnished for 1 *C low temperature.

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
E1	start steam regulator	7c, SV-1, stm to chmbr** *	
E2	Come-up Sc: Temp limit ***	7c, SV-1, stm to chmbr** 22c,SV-5a, trap valve *	
E3	Sterilization (4) Sc: Temp limit	7c, SV-1, stm to chmbr** 22c,SV-5a, trap valve *	Delay stertime To: stertime + 2 min
E4	Close valves	*	
E5	Select post vacuum	*	

* Outputs which are always on during this step

4c, SV-6, seal load door
12c, SV-8, seal unload door (Bioseal units)
21c, SV-2, STM to JCKT(regulated using TD-2)

** Regulated using analog input TD-1

*** Temp limit = Chambtemp and Loadtemp(s) higher than Stertemp-1.

(4) Timeout during Sterilization: The Stertime is accumulated whenever the templimit is OK. If the temperature is too low for the amount more than 2 minutes, timeout will be indicated.

Sterilizer type : **NOVUS I Standard**

Phase Description : **POST VACUUM**

- POST CONDITIONING (Drying) - Steam is removed from the chamber and load by the vacuum pumping system. When a suitable vacuum has been achieved, a timer will be energized to hold the chamber under vacuum conditions for the set time (0 - 999.0 minutes), to ensure dryness of the load.

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
F1	Exhaust chamber	5c, SV-10, pump 8c, SV-4, fast exhaust *	
F2	Check pressure Sc: pressure under limit **	5c, SV-10, pump 8c, SV-4, fast exhaust *	
F3	Hold for set drytime	5c,SV-10, pump 8c,SV-4, fast exhaust *	Delay:drytime To:drytime + 1 min**
F4	Close fast exhaust	5c,SV-10, pump *	Delay: 10 sec
F5	Turn off pump	*	
F6	Turn on air filter	6c,SV-3, air filter *	Delay: 20 sec
F7	Select end	6c,SV-3, air filter *	

* Outputs which are always on during this step

4c, SV-6,seal load door
12c, SV-8,seal unload door (Bioseal units)
21c, SV-2,STM to JCKT(regulated using TD-2)

** Drytime is accumulated when pressure is less than 10 PSIA. In the case of an abort pressure must be less than 1 PSIG.

Sterilizer type : **NOVUS I Standard**

Phase Description : **SLOW EXHAUST**

- POST CONDITIONING (Cooling) - Steam is removed from the chamber by controlled venting from the chamber drain to prevent excessive boil off of liquids. The venting rate is programmable through the service mode (preset at factory for optimal results). When 5" Hg pressure is attained in the chamber or the drain temperature is below boiling point, the "cooling" phase is completed.

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
H1	start drain regulator	8c, SV-4, fast exhaust ** *	
H2	Check pressure Sc: pressure under 2 PSIG	8c, SV-4, fast exhaust ** *	To: 90 min
H3	stop Drain regulator start trap regulator	5c,SV-10, pump 22c,SV-5a, trap **	
H4	Check temp and pressure Sc: temp limit*** or pressure less 5" Hg	5c, SV-10, pump 22c, SV-5a, trap** *	
H5	Stop Trap regulator Turn on air filter	5c,SV-10, pump 6c,SV-3, air filter *	Delay: 10 sec
H6	Turn off pump	6c,SV-3, air filter *	
H7	Admit air	6c,SV-3, air filter *	Delay: 20 sec
H8	Select end	6c,SV-3, air filter *	

* Outputs which are always on during this step

4c, SV-6, seal load door
12c, SV-8, seal unload door (Bioseal units)
21c, SV-2, STM to JCKT(regulated using TD-2)

** Regulated using analog input PT-1

*** Temp limit = Chambtemp and Loadtemp(s) less than boiling point - 2.0 *C

Sterilizer type : NOVUS I Standard

Phase Description : CYCLE END

- CYCLE END - At completion of the drying time, the vacuum system is terminated and filtered air admitted to the chamber until atmospheric pressure is attained.

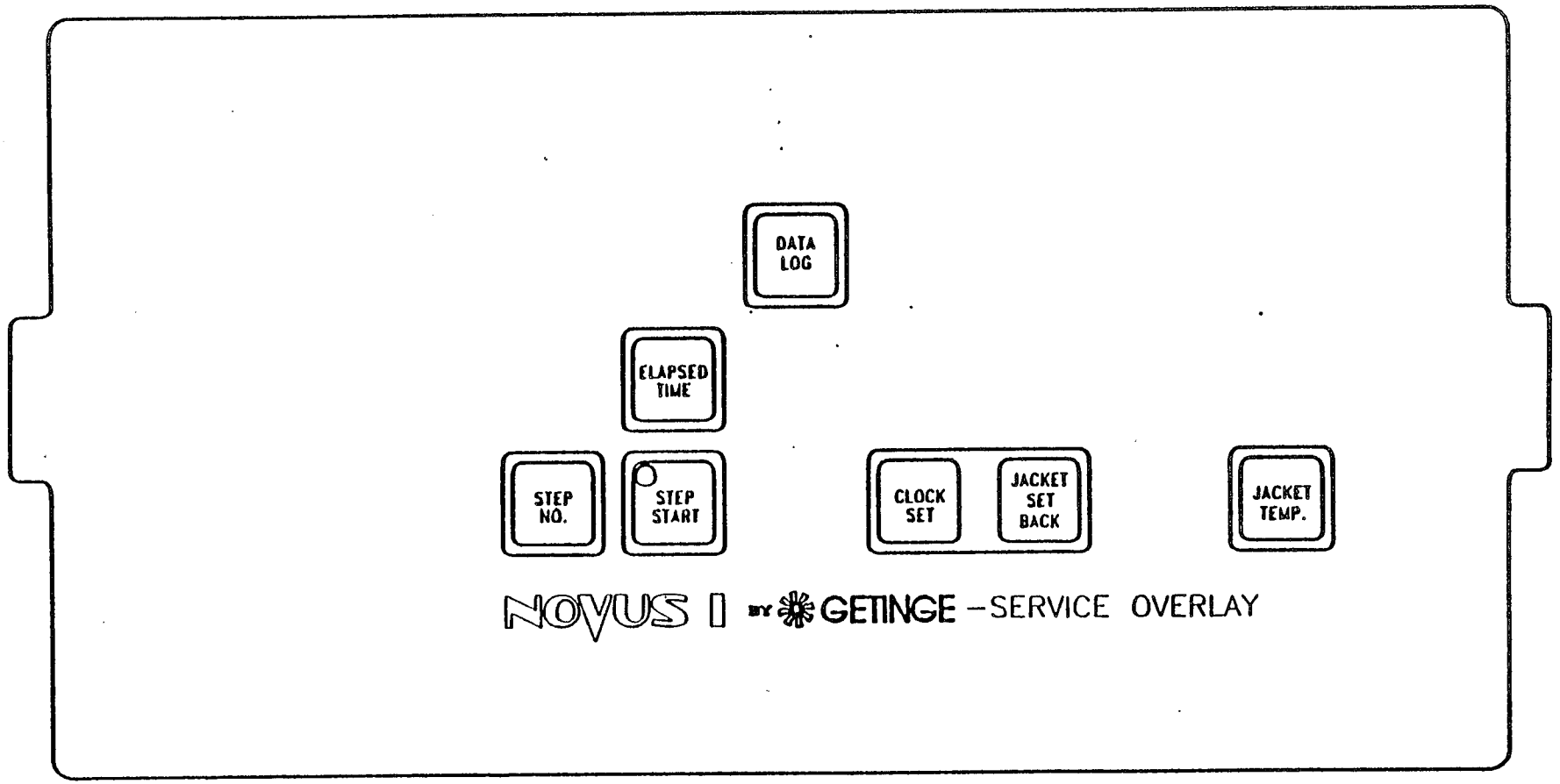
Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
I1	Initialize end phase	6c,SV-3, air filter *	
I2	Check pressure Sc: pressure less than 1.0 PSIG	6c,SV-3, air filter *	
I3	Auto blow down	6c,SV-3, air filter 14c,EBV-14, autoblowdown *	Delay: 6 sec
I4	Pull seal ***	6c,SV-3, air filter 3c,SV-7, unseal load door 5c,SV-10, pump	Delay: 1 min**
I5	Select door sequence		

* Outputs which are always on during this step

4c, SV-6,seal load door
12c, SV-8,seal unload door (Bioseal units)
21c, SV-2,STM to JCKT(regulated using TD-2)

** 30 seconds on FLASH cycles.

*** bioseal units skip this step.


DATA LOG
ELAPSED TIME
STEP NO.
STEP START
CLOCK SET
JACKET SET BACK
JACKET TEMP.
NOVUS I by GETINGE – SERVICE OVERLAY

NOVUS I STERILIZERS

Laboratory Hi Vacuum

Getinge International Inc.

1100 Towbin Ave.

Lakewood, NJ 08701

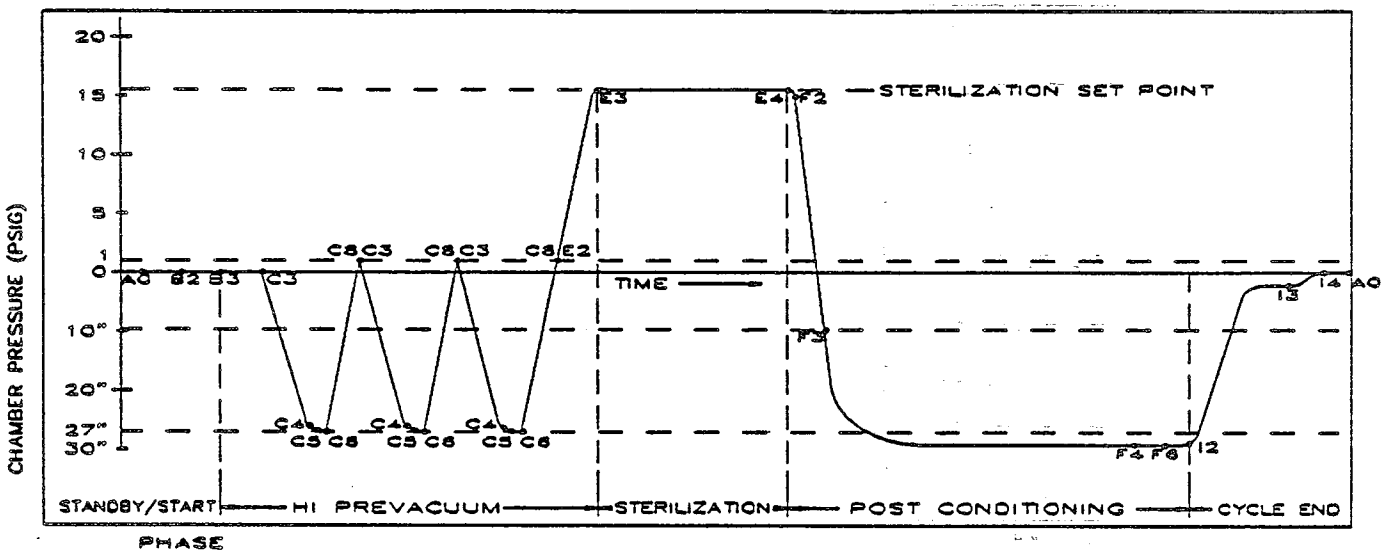
Cycle Graphs And Phase Descriptions

INTRODUCTION: This package contains all necessary information needed to understand the characteristics of a NOVUS I Sterilizer. NOVUS I sterilizers usually have several cycles. These cycles are defined on the following pages by cycle graphs and phase descriptions. The cycle graph depicts pressure as a function of time and separates the various segments of the cycle into phases. Each phase is then further defined by its phase description.

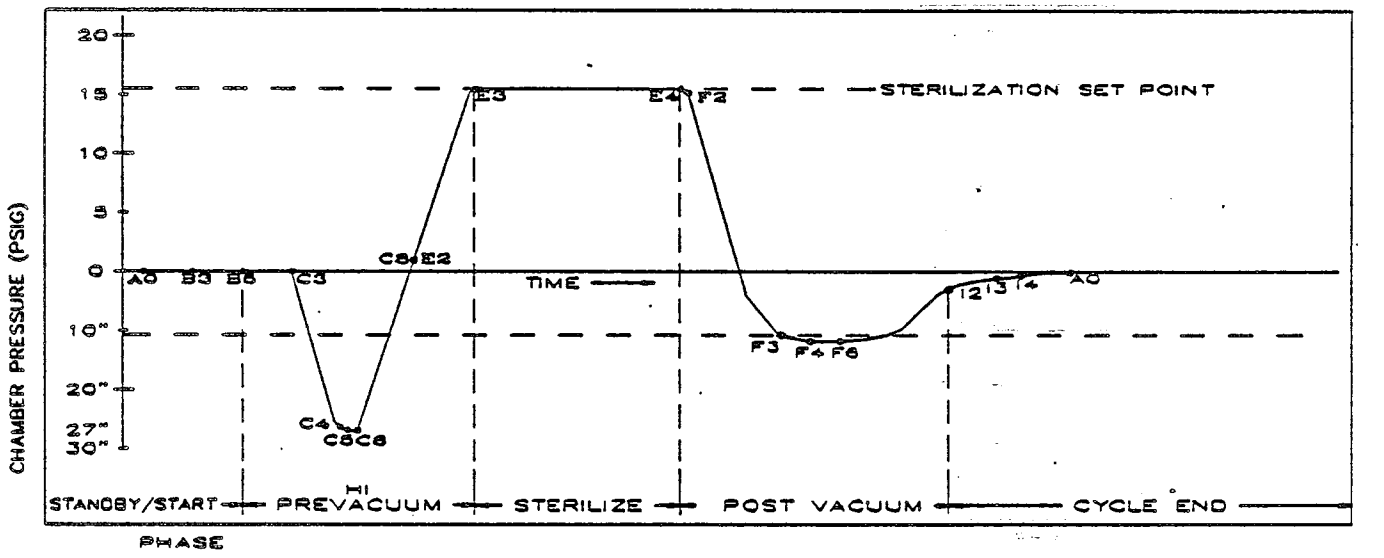
HOW TO USE THIS PACKAGE: Each cycle is divided into phases. The phase is labeled on the lower portion of each cycle graph. Match the phase label to its phase description page in the package. The phase description divides the phase into steps. Each step has a corresponding step number which refers to the actual step number used in the NOVUS I controller. The step number display is enabled by moving the dipswitch on bank 1 pole 1 to the "ON" position. Pressing the service button to the left of the START button will display the step number (see attached service overlay, the button is labeled STEP NO). Each step is then broken down into several divisions. General information and step conditions are described. Energized outputs are indicated by a pin, tag and its description. Pin refers to the number stamped on the controller side of the I/O connector. Tag refers to the label physically attached to the valve, and the description, of course, describes the valve. Time-out and delay times if applicable are indicated. Time-outs occur when step conditions (Sc) are not met within the allotted time.

NOVUS I — LABORATORY HI VACUUM

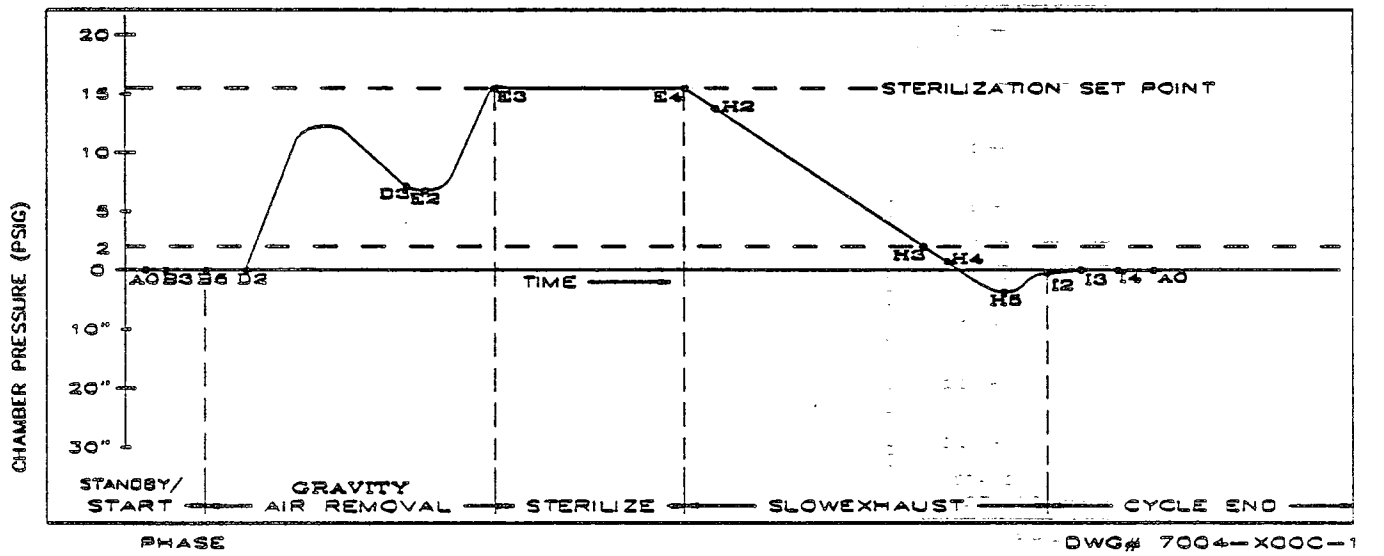
(Refer to phase descriptions for a further explanation of each phase)



P1 — Wrapped Goods



P5 — Quick Cycle



P3 — Liquids

	Sterilizer type :	**NOVUS I Standard**	
	Phase Description :	**STANDBY**	
Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
A0	Init of process.	21c, SV-2, Steam to Jacket* 3c, SV-7, unseal load door 11c, SV-9, unseal unload door**	
	conditions needed to attain start light: - cycle selected - parameters set - all errors cleared - doors OK (input 3a set) - steam generator OK or input 9a made - not in clock set mode - not in jacket set back mode Sc: start light and START button		
	< < < < < < < < < < < < < < < OR > > > > > > > > > > > > > > >		
	Phase Description :	**JACKET SET BACK STANDBY**	
S1	Shut off all outputs		
S2	Turn off jacket regulator		
S3	Check for a new day (12:00pm) Sc: start button***		
S4	Wait Sc: Time of day greater than set ON time or start button pressed***		
S5	Service check****		
S6	Initialize cycles		short time delay

* Regulated using analog input TD-2

** Bioseal units only

*** Pressing the start button will bring the unit back to the regular standby phase. The unit will return to the jacket set back mode

**** Optional equipment which is enabled using dipswitch [1,3].

Sterilizer type : NOVUS I Standard

Phase Description : START

- START - The unit ensures that doors are closed and that the jacket temperature is near set temperature. Door seal(s) are energized and on ETO units a 20 minute warm-up period is instituted. Should a door not properly close, the jacket not come up to temp, or door seal not properly seal, a timeout will be indicated.

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
B1	Print start text	3c, SV-7, unseal load door 11c, SV-9, unseal unload door* 21c, SV-2, STM to JCKT**	
B2	Doors closed Sc: input 3a (LS-1, LS-2)	3c, SV-7, unseal load door 11c, SV-9, unseal unload door* 21c, SV-2, STM to JCKT**	To: 3 min.
B3	Jacket temp check Sc: TD-2 greater than set STERTEMP - 3.0*c	4c, SV-6, seal load door 12c, SV-8, seal unload door* 21c, SV-2, STM to JCKT**	To: 60 min
B4	Seal door(s)	4c, SV-6, seal load door 12c, SV-8, seal unload door* 21c, SV-2, STM to JCKT**	
B5	Check door seal Sc: input11a(PS-1), input12a(PS-2)*	4c, SV-6, seal load door 12c, SV-8, seal unload door* 21c, SV-2, STM to JCKT**	Delay: 5 sec To: 60 sec
B6	ETO only warm up chamber	4c, SV-6, seal load door 12c, SV-8, seal unload door* 21c, SV-2, STM to JCKT**	Delay: 20 min

* Bioseal units only

** Regulated using analog input TD-2

Sterilizer type : **NOVUS I Standard**

Phase Description : **HI PREVACUUM**

- AIR REMOVAL - During the air removal stage of the cycle, air is removed by the vacuum pump until 1.5 psia (27" Hg) is attained, steam is pulsed into the chamber to mix intimately with the residual air. The air/steam mixture is removed by the vacuum pumping system. The steam pulses with vacuum continues for a set number of excursions, ensuring optimum air removal.

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
c1	Initialize	*	
c2	Check vac level Sc: pressure 1.5 PSIA or 10 min	5c, SV-10, pump 8c, SV-4, fast exhaust *	
c3	do a log	5c, SV-10, pump 8c, SV-4, fast exhaust *	
c4	Hold vacuum	5c, SV-10, pump 8c, SV-4, fast exhaust *	Delay:30 sec
c5	Turn on steam to chamber	5c, SV-10, pump 7c, SV-1, steam to chamber ** 8c, SV-4, fast exhaust *	Delay: 6 sec
c6	Close fast exhaust	5c, SV-10, pump 7c, SV-1, steam to chamber ** *	Delay:10 sec
c7	Turn off pump	7c, SV-1, steam to chamber ** *	
c8	Check pressure level Sc: Pressure greater than 15.7 PSIA	7c, SV-1, steam to chamber ** *	

Repeat steps c1-c8 two more times for a total of three pulses (QUICK cycles do one pulse only!)

* Outputs which are always on during this step
4c, SV-6, seal load door
12c, SV-8, seal unload door (Bioseal units)
21c, SV-2, STM to JCKT(regulated using TD-2)

** Regulated using analog input TD-1

Sterilizer type : **NOVUS I Standard**

Phase Description : **GRAVITY AIR REMOVAL**

- AIR REMOVAL - Steam is admitted to the chamber forcing air and condensate through the chamber drain until saturated steam conditions are attained (ie. temperature correlates with pressure), at which point the drain vent valve closes.

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
D1	Initialize	5c,SV-10, pump ** 7c, SV-1, Steam to chamber *** 8c, SV-4, Chamber drain *	
D2	Check for air Sc: pressure, temperature correlation or time ****	5c,SV-10, pump ** 7c, SV-1, Steam to chamber *** 8c,SV-4, Chamber drain *	
D3	time delay *	5c,SV-10, pump ** 7c, SV-1, Steam to chamber *** 8c, SV-4, Chamber drain	Delay:15 sec
D4	close valves	7c, SV-1, Steam to chamber *** *	
D5	next phase		

* Outputs which are always on during this step

4c, SV-6, seal load door
12c, SV-8, seal unload door (Bioseal units)
21c, SV-2, STM to JCKT(regulated using TD-2)

** except on Hi Vac units

*** Regulated using analog input TD-1

**** 75 seconds on FLASH cycles, 5 minutes on all other cycles.

Sterilizer type : NOVUS I Standard

Phase Description : STERILIZE

- STERILIZING - Steam is admitted to the chamber until the selected temperature is attained (100-135 *C). Sterilizing exposure may be selected by overkill time (0-999.0 minutes). Alarms, to alert the operator, are furnished for 1 *C low temperature.

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
E1	start steam regulator	7c, SV-1, stm to chmbr** *	
E2	Come-up Sc: Temp limit ***	7c, SV-1, stm to chmbr** 22c,SV-5a, trap valve *	
E3	Sterilization (4) Sc: Temp limit	7c, SV-1, stm to chmbr** 22c,SV-5a, trap valve *	Delay stertime To: stertime + 2 min
E4	Close valves	*	
E5	Select post vacuum	*	

* Outputs which are always on during this step

4c, SV-6, seal load door
12c, SV-8, seal unload door (Bioseal units)
21c, SV-2, STM to JCKT(regulated using TD-2)

** Regulated using analog input TD-1

*** Temp limit = Chambtemp and Loadtemp(s) higher than Stertemp-1.

(4) Timeout during Sterilization: The Stertime is accumulated whenever the templimit is OK. If the temperature is too low for the amount more than 2 minutes, timeout will be indicated.

Sterilizer type : **NOVUS I Standard**

Phase Description : **POST VACUUM**

- POST CONDITIONING (Drying) - Steam is removed from the chamber and load by the vacuum pumping system. When a suitable vacuum has been achieved, a timer will be energized to hold the chamber under vacuum conditions for the set time (0 - 999.0 minutes), to ensure dryness of the load.

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
F1	Exhaust chamber	5c, SV-10, pump 8c, SV-4, fast exhaust *	
F2	Check pressure Sc: pressure under limit **	5c, SV-10, pump 8c, SV-4, fast exhaust *	
F3	Hold for set drytime	5c,SV-10, pump 8c,SV-4, fast exhaust *	Delay:drytime To:drytime + 1 min**
F4	Close fast exhaust	5c,SV-10, pump *	Delay: 10 sec
F5	Turn off pump	*	
F6	Turn on air filter	6c,SV-3, air filter *	Delay: 20 sec
F7	Select end	6c,SV-3, air filter *	

* Outputs which are always on during this step

4c, SV-6,seal load door
12c, SV-8,seal unload door (Bioseal units)
21c, SV-2,STM to JCKT(regulated using TD-2)

** Drytime is accumulated when pressure is less than 10 PSIA. In the case of an abort pressure must be less than 1 PSIG.

Sterilizer type : **NOVUS I Standard**

Phase Description : **SLOW EXHAUST**

- POST CONDITIONING (Cooling) - Steam is removed from the chamber by controlled venting from the chamber drain to prevent excessive boil off of liquids. The venting rate is programmable through the service mode (preset at factory for optimal results). When 5" Hg pressure is attained in the chamber or the drain temperature is below boiling point, the "cooling" phase is completed.

Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
H1	start drain regulator	8c, SV-4, fast exhaust ** *	
H2	Check pressure Sc: pressure under 2 PSIG	8c, SV-4, fast exhaust ** *	To: 90 min
H3	stop Drain regulator start trap regulator	5c,SV-10, pump 22c,SV-5a, trap **	
H4	Check temp and pressure Sc: temp limit*** or pressure less 5" Hg	5c, SV-10, pump 22c, SV-5a, trap** *	
H5	Stop Trap regulator Turn on air filter	5c,SV-10, pump 6c,SV-3, air filter *	Delay: 10 sec
H6	Turn off pump	6c,SV-3, air filter *	
H7	Admit air	6c,SV-3, air filter *	Delay: 20 sec
H8	Select end	6c,SV-3, air filter *	

* Outputs which are always on during this step

4c, SV-6, seal load door
12c, SV-8, seal unload door (Bioseal units)
21c, SV-2, STM to JCKT(regulated using TD-2)

** Regulated using analog input PT-1

*** Temp limit = Chambtemp and Loadtemp(s) less than boling point - 2.0 *C

Sterilizer type : NOVUS I Standard

Phase Description : CYCLE END

- CYCLE END - At completion of the drying time, the vacuum system is terminated and filtered air admitted to the chamber until atmospheric pressure is attained.

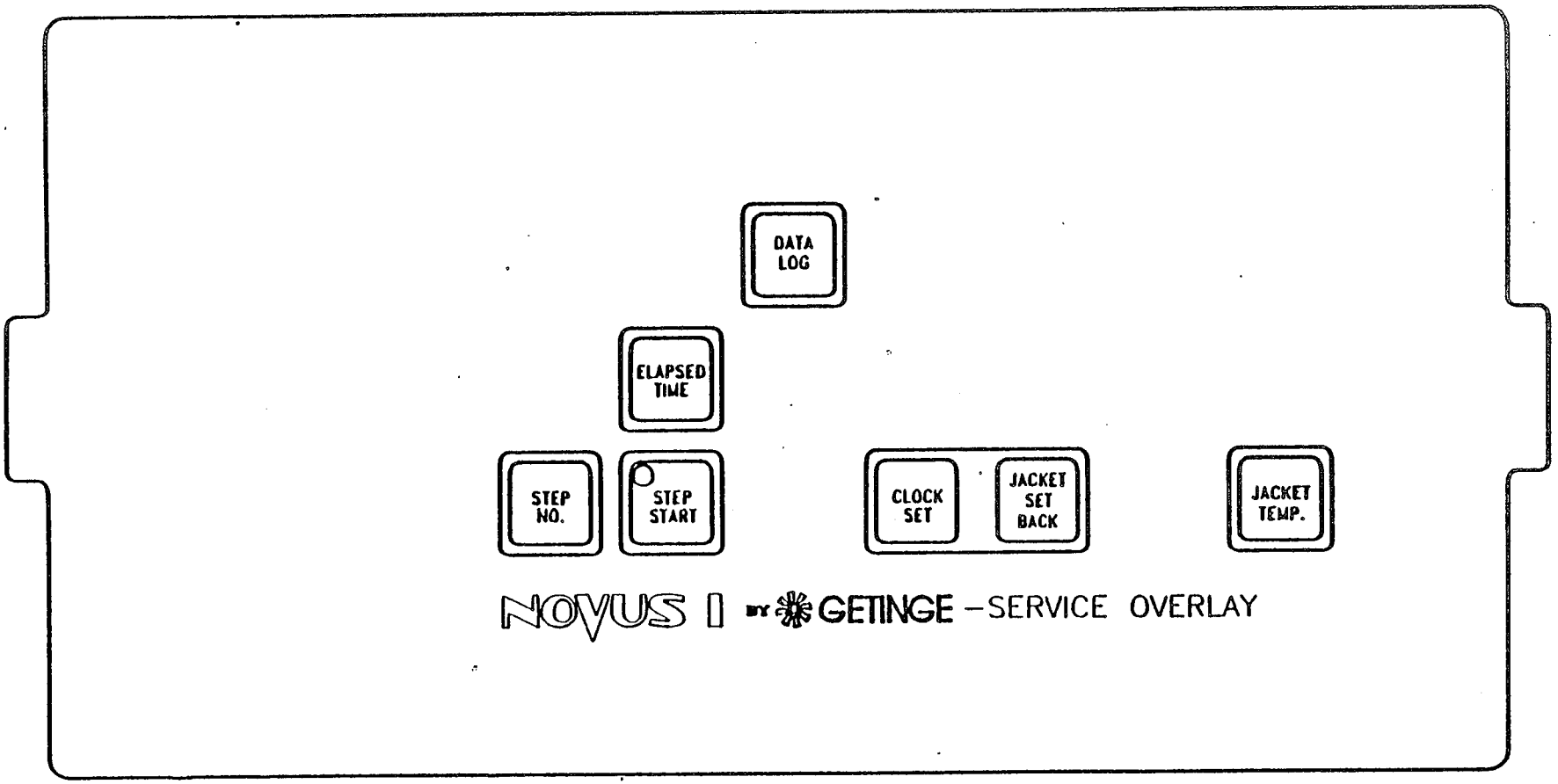
Step	Operation/ Stepcondition(Sc)	Outputs (pin, tag, desc.)	Delay/ timeout(To)
I1	Initialize end phase	6c,SV-3, air filter *	
I2	Check pressure Sc: pressure less than 1.0 PSIG	6c,SV-3, air filter *	
I3	Auto blow down	6c,SV-3, air filter 14c,EBV-14, autoblowdown *	Delay: 6 sec
I4	Pull seal ***	6c,SV-3, air filter 3c,SV-7, unseal load door 5c,SV-10, pump	Delay: 1 min**
I5	Select door sequence		

* Outputs which are always on during this step

4c, SV-6,seal load door
12c, SV-8,seal unload door (Bioseal units)
21c, SV-2,STM to JCKT(regulated using TD-2)

** 30 seconds on FLASH cycles.

*** bioseal units skip this step.


DATA LOG
ELAPSED TIME
STEP NO.
STEP START
CLOCK SET
JACKET SET BACK
JACKET TEMP.
NOVUS I by GETINGE – SERVICE OVERLAY

A D D E N D U M I

ABORT CYCLE

If for any reason you want to stop a cycle, the abort button is a feature that allows you to interrupt any cycle, regardless of what stage the cycle is in at the time of pressing the button.

The steps to operate the abort feature are as follows:

1. Press the abort button (see FIG. ADDENDUM 1). Right after pressing this button, the alarm will sound and the "FAULT" signal on the control panel will light.

2. Once you are aware that the abort process has started, you might want to stop the alarm. In order to stop the alarm, you only need to press the FAULT button once.

   Immediately after pressing the FAULT button, the display on the control panel will show ER3 which is the indicator that the cycle has been aborted.

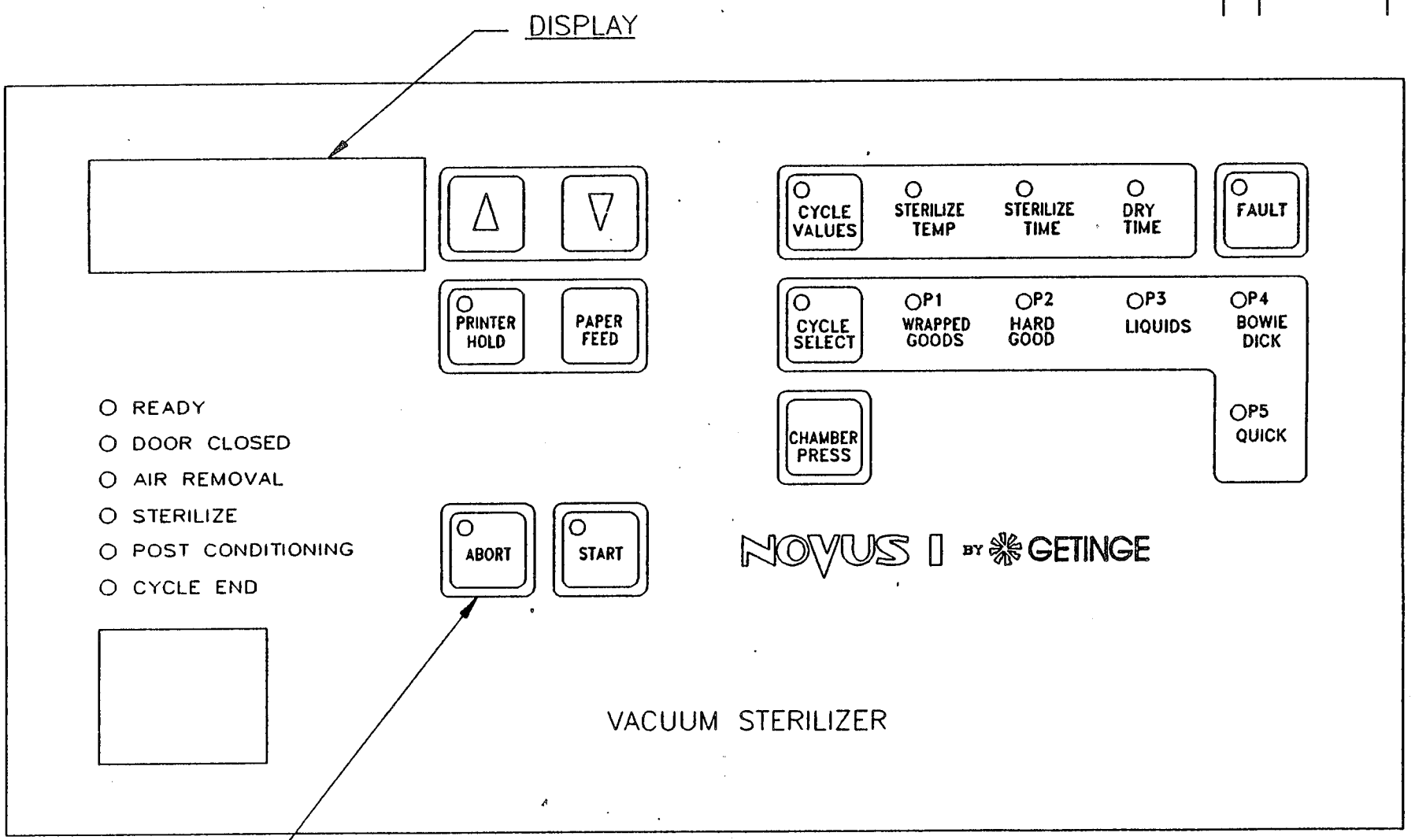
3. The main control automatically will bring the pressure inside the chamber to atmospheric pressure, this normalization of the pressure will take a few minutes.

4. When the pressure inside the chamber reaches atmospheric pressure, the display on the control panel and the sound signal will indicate the end of the cycle.

5. At the end stage of the cycle, you can reset the unit for another cycle just by pressing the FAULT button one more time.

   Also, when the unit reaches the end of cycle stage, you will be able to open the door if you wish, but this is not necessary in order to reset the unit.

   Now, you are ready for another cycle.



NOTE: Your control panel might look different than the one shown on this figure.

FIG. ADDENDUM 1

GETINGE INTERNATIONAL INC.
1100 TOWBIN AVE., LAKEWOOD, NJ 08701

NOVUS PACS OVERLAY

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